HOLIDAY GREETINGS

Once more the Holiday Season is approaching, and the feeling of peace and good will engendered by the feast of Christmas, merge quite naturally into the new year's felicitation.

The publishers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, imbued with this holiday spirit, take this opportunity to extend to all of their readers and friends the wish that has come down to us through the centuries:

A Merry Christmas and
A Happy New Year

THIS MONTH'S COVER

The picture used for our cover this month is the first of a series that will illustrate .Industry in action.

The present picture shows a close-up of a Bessemer converter.

Photo by Publishers' Photo Service, New York.

Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."

Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1931, by Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930. Member Associated Business Papers and Audit Bureau of Circulations.

Subscription Information — Subscription price, $2.50 per year, payable in advance. Canadian and Mexican postage, 35 cents, foreign countries, 50 cents. Copies not over three months old, 25 cents; more than three months, 50 cents. Notices for discontinuance of subscription must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions — The Editors invite contributions bearing upon Industrial Arts, Vocational Education, Manual Training, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

PUBLISHED MONTHLY BY

THE BRUCE PUBLISHING COMPANY

524-544 NORTH MILWAUKEE STREET

MILWAUKEE, WISCONSIN

WESTERN OFFICE: 66 E. SOUTH WATER ST., CHICAGO, ILL.
EASTERN OFFICE: 342 MADISON AVENUE, NEW YORK, N. Y.

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A NEW 20 INCH SCROLL BAND SAW

Front view of new Yates-American Y-20 Scroll Band Saw. Notice that the table lock is brought out to the front of the machine where it can be reached by operator without necessity of walking around the table. The small handwheel immediately below the upper wheel guard adjusts the saw tension. Note the convenient position of the push buttons for stopping and starting the machine.

This new Yates-American Y-20 20" Scroll Band Saw is a high class, quality machine that will prove particularly desirable for school use. In every sense it is as much a commercial production machine as the larger 30" and 36" models; the only difference being that of capacity. The illustration gives an idea of its modern design and durable, lasting qualities. It is direct motor driven, fully ball bearing; has tilting table, cast aluminum wheel guards, perfectly balanced wheels, completely guarded saw blade and many other advanced features. An illustrated circular is available and will be gladly sent on request. A brief study of the specifications below will indicate Y-20's adaptability to practically universal school use at a decided saving in investment cost over the larger models.

SPECIFICATIONS

WHEELS—20" diameter, 1⅛" face, upper wheel aluminum disc, lower wheel web type cast iron. Both wheels rubber covered.

TABLE—Main table 26" x 26" tilting 45 degrees to right and 5 degrees to left. Tilting device is indexed and locked from operator's position. Auxiliary table stationary 7¼" x 9½".

BEARING—Ball bearing upper wheel, lower wheel mounted on ball bearing motor shaft.

WHEEL GUARDS—Cast aluminum doors. One door above and one below.

STRAINING DEVICE—Spring type acting directly on top wheel bearing bracket.

SAWS—Up to 1" wide can be used. Longest 11' 10", shortest 11' 4". One ⅜" wide 24 gauge saw furnished.

CAPACITY—Widest 19½" from saw to frame with guard on. Thickest under guide 10".

FLOOR SPACE—26" x 41"

YATES-AMERICAN MACHINE COMPANY

VOCATIONAL MACHINERY DIVISION

BELOIT, WISCONSIN

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Volume 20 JANUARY, 1931 Number 1

Technical Education in Great Britain—I

*Thomas Diamond**

THE purpose of the study upon which these articles are based has been to secure authentic information regarding technical education in Great Britain, and to prepare it in such form as might be suitable for distribution among the teachers and administrators in the field of vocational or industrial education in the United States.

It is believed that those who are engaged in educational work on this side of the Atlantic, and who have not had a first-hand knowledge of this type of work abroad, will welcome a view of a type of education which is considered to be of major importance in Great Britain.

It is not suggested that the ideas presented are desirable for this country, but the study should be of special value to those individuals who are engaged in the field of vocational or industrial education, as that is the type of education which nearly approaches the work done here under that name.

In carrying on the investigation, the writer made an exhaustive study of the current literature on the subject. A large number of technical schools were visited in England and Scotland. Numerous publications on technical education issued by the British government and by local educational authorities have been examined, and personal conferences have been held with a number of influential schoolmen in Britain. The results of the study were brought together and were then reviewed by certain individuals interested in technical education before they were finally incorporated in this report.

Much of the material included has been taken directly from various publications collected while visiting schools, and any comments or interpretations of this material are presented merely as the personal opinion of the author, based upon information received during a personal contact with the schools being discussed.

Scope

The following two definitions indicate a decided difference in the point of view of American and British writers, and bring out a fundamental barrier to any effort to compare the technical education of the United States with the technical education of Great Britain.

The first of these — by an American — is quite in keeping with the viewpoint of Americans. An *Engineer* in the United States may drive a locomotive; he may be in charge of the power units in a pumping station or a power station; or he may be a professional man whose business demands that he must have a high-grade college training. In general, however, the term *Engineer* is applied to the college-trained man, and it is this conception that Monroe has when he writes:

"... 'Technical Education' is synonymous with 'Engineering Education' ... and is limited to include that training which prepares men for the major professions of engineering. ..."[1]

In contrast with the American practice, we find the Britisher is more specific. The man in charge of a locomotive is an *engine driver*; the individual who looks after a stationary engine is an *engine man*; the *engineer* is distinctly and exclusively the same as the all-round machinist in this country, and no one has the slightest doubt about what is meant when the occupation is referred to. With this in mind, it is less difficult to understand the Britisher who defines technical education as:

". . . the special training of persons in the art and sciences that underlie the practice of some trade or profession . . . it is usual to restrict the term to the special training which helps to qualify a person to engage in some branch of productive industry . . . it may consist of the explanation of the processes concerned in production or of instruction in art or science in its relation to industry, but it may also include the acquisition of the manual skill which production necessitates."[2]

The breadth of this definition is entirely in keeping with the type of training provided in the technical schools of Great Britain. There one may find students working on subjects ranging from the most elementary

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[1] *Monroe's Cyclopedia of Education*, Vol. 5, p. 544.
[2] *Encyclopaedia Britannica*, 11th Edition, Vol. 26, p. 487.

to the most advanced type of research, and every student striving to prepare himself for the next step ahead.

As we consider these definitions it becomes obvious that any attempt to compare technical education in the two countries with the American definition in mind would only lead to confusion. Therefore, in order to simplify the problem, it is proposed to avoid any consideration of technical education as it is known in the United States. This automatically eliminates work of college grade. When this is done, a revised British definition would read: "Technical education is the special training of persons in the arts and sciences that underlie the practice of some trade or profession (*and which is of less than college grade*)."

When expressed in this form, technical education begins to assume a form that is easily understood by educators who are doing similar work in this country. An examination of the bulletins issued by the Federal Board for Vocational Education would be likely to uncover a statement to the effect that "Industrial Education is any form of education that has for its purpose the 'preparation of an individual to follow more effectively a trade or industrial pursuit, and which is of less than college grade.'" Thus we see that Britishers and Americans are thinking alike on this matter, although they choose to express their thoughts in different terms. In other words, we have two educational movements, on opposite sides of the Atlantic, in which the aims are identical, however different the methods used in attaining these aims may appear.

In order, therefore, that no ambiguity may exist in regard to the field covered in this report, it is to be understood that for the present purpose, the definition of technical education shall be synonymous with the definition of Industrial Education as given by the Federal Board.

History

Modern technical education, insofar as Britain is concerned, may be said to have had its origin in the founding of Anderson's University in Glasgow, toward the close of the eighteenth century. One of the first professors of this institution. Dr. Birkbeck, formed a class in Glasgow in which he endeavored to instruct the workers of that city in chemical and mechanical philosophy. This instruction was given free, and was so popular that in 1825 the class separated from the University and became known as the "Mechanics Institute." Later, it amalgamated with other organizations and became what is now known as "The Royal Technical College of Glasgow."

Dr. Birkbeck soon found that the possibilities of this work were somewhat limited owing to the lack of preparation on the part of his students. As a result of his experience he concluded that a good foundation of secondary education was essential if technical education was to be effective. This conclusion was supported by the judgment of a Royal Commission on Technical Education which was later assigned the task of investigating the problem of the technical education both at home and on the continent. Doubtless, this conclusion accounts for the somewhat rigid courses of study set up in the technical schools of Britain and for the requirement of certain prerequisites before a student may enter a technical class.

From Scotland the movement spread to England where we find the first Mechanics Institute being set up in London in 1824, Dr. Birkbeck, who had moved to London in the meantime, was again responsible for this beginning. After this, the development of the work throughout the country was quite rapid.

The first International Exhibitions held in London in 1851 and 1852 revealed to the British the importance of science and art in industry. They realized also that, because of the neglect of these factors, their products compared most unfavorably with those from other nations. After the war of 1870, Germany became a formidable rival in trade, as a result of her educational system. The Paris Exposition of 1878 emphasized still more strongly that Britain was falling behind. When this condition was finally appreciated, it added more stimulus to the development of technical training and led to the appointment of a Royal Commission in 1880 to study the situation and make recommendations. The Commission visited a number of different countries and in their final report they urged most strongly that legislation be passed to enable localities to establish and maintain technical and secondary schools.

For many years, up to as late as 1880, these technical schools obtained most of their funds from a division of the government which was known as "The Science and Art Department." The grants to be disbursed by this department were based upon the number of students in any class who passed satisfactorily an examination conducted under its direction.

In 1879, by arrangement with the Science and Art Department, the City Guilds of London Institute began to supplement the work that had been done, by offering grants to schools. Like those offered by the government body, the awards were based upon the results of examinations conducted by the Institute. During the period between 1879 and 1897 this Institute coöperated with the Science and Art Department in the development of all work all over Great Britain. In 1897 the administration of the science and art grants was turned over to the Board of Education in England and to the Scottish Education Department in Scotland. These two bodies became the supreme authorities on education in the two countries and assumed the responsibility of disbursing such funds as the government provided for the purpose of stimulating this type of education.

Further impetus was given to the work when the Technical Instruction Act of 1889 was passed. By means of this law:

1. Local authorities are empowered to aid technical or manual instruction out of local taxes.

2. Local authorities are permitted to determine the extent to which aid should be given and the conditions under which it should be given.

3. No one may attend classes held under the Act if he is at the same time attending a public elementary school.

4. The local authorities may conduct examinations to determine those qualified to profit from the instruction.

5. The Act shall not extend to Scotland.

Again in 1891 The Local Excise Act (Customs and Excise) made it possible for the council of any county or county borough in England to spend certain proportions of the share of the money collected through customs and excise on technical education. It also permitted the county to give such fund to any city or town to be spent in accordance with the purpose of the Act.

In 1891 another Act was passed which gave additional authority to local education authorities in England and Wales. Through it the following procedure was made possible:

1. Local authority may aid technical or manual instruction in an institution outside of its district in cases where in their judgment, it is more advantageous to do so.

2. A local authority may provide or aid in providing scholarships to encourage work in technical education.

3. A local authority may pay the fees of residents in its district at institutions within or without its territory.

Prior to 1919 the aid provided for technical education was disbursed to institutions of all grades provided they met the standards set up by the authorities. After this date no grant was given to institutions of university grade unless in the cases of schools where evening and day classes are carried on, which are not conducted under the regulations for degrees. In other words, we find a condition in regard to the parliamentary grants for this work which to some extent resembles a provision in the Smith-Hughes Law, in that the work taught must be of less than college grade. The only difference lies in the fact that while the British authorities provide courses which, generally speaking, are of less than college grade, they do not hesitate to provide advanced work for the many able students who come to the technical classes from the industries. While the workers who are able and willing to do this advanced work cannot obtain degrees from the technical school, the work they do in many cases serves as a preparation for the examinations which they must take should they decide to be graduated from one of the standard universities.

Background

Before a person interested in education in the United States can fully appreciate the problems discussed here, it seems desirable that he should have some idea of the plan on which British educational procedure is based. It is with this thought in mind that the following brief sketches of the educational systems in vogue in Britain are presented. They should make clear the educational background possessed by those who attend the technical classes and perhaps convey a picture of the whole educational scheme. In the first place, the public system of education in England and Wales is separate from, and independent of, that in Scotland. In the former case, the ruling body is the Board of Education; in the latter, it is the Scottish Education Department. These ruling bodies are recognized branches of the government and occupy entirely separate offices in different government buildings in Whitehall, London. In view of this it is not surprising to find that the procedure in Scotland is different in some respects from that in England and Wales. This may be accounted for by the fact that Scotland seems to maintain the same attitude toward its rights to direct its own educational policies as do the several states in the United States.

England and Wales

Figure 1 illustrates the route by which the boy in England or Wales climbs the education ladder provided by the Board of Education.

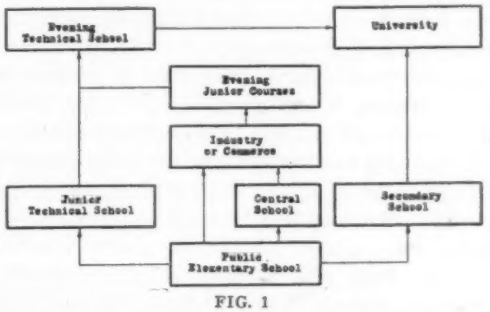

FIG. 1

The first step in the educational plan for 80 per cent of the children between 5 and 14 is the public elementary school. It will be noted that the pupil may travel from the elementary school directly through the secondary school to the university. Again he may enter the industrial or commercial field through the junior technical school or through the central school, or he may go directly into these fields from the elementary school. In any one of the three latter cases a student may finally reach the regular technical classes held in the evening, and from there to the university is relatively simple for the student with ability.

For those interested in vocational guidance it will be of interest to know that, generally speaking, children are called upon to decide the route over which they wish to travel, at the age of 11 or 12. Under certain conditions they are permitted to leave school at 14. Two years before this point has been reached by the child, he is called upon to make a decision in regard to the length of time he expects to remain in school. If he plans to enter the university, and therefore decides to enter the secondary school, he must sign an agreement to attend until he is 17.

Unfortunately there are not places in the secondary school for all who might elect to attend. In order to reduce the number of applicants, a qualifying examination is given. Those who survive this examination are then required to take a competitive examination upon which they are rated in their order of merit. When this is done, those who stand at the top of the list are given first chance to choose the secondary school they wish to attend. After all the places are filled there are still some left who have the ability to assimilate a higher type of education than is usually given in the elementary school. This group may attend a central school. The work done in this school is substantially the same as in the secondary school, with the exception that it has a decided industrial or commercial bias.

If the child has no desire to take advantage of this higher type of education, or if for any reason he cannot do so, he may select the junior technical school which is intended to prepare young people for entrance into the better positions in industry and commerce. In this case he must sign an agreement that he will remain in school until he reaches 15. Those who have no desire to travel along either of these routes but who are interested only in leaving school at as early an age as possible, are allowed to continue in the elementary school until they are 14, when the regular compulsory-attendance act ceases to apply.

After the undertaking or agreement to remain in school is signed it has all the force of law, and the authorities do not hesitate to fine those offenders who break them without sufficient cause. Thus we see that the English youth has to declare his ambition at an early age and is required to abide by his decision for a period long enough for him to be sure whether or not he has made a mistake.

It is important to note that the junior technical school is not a preparatory school for the senior technical school; it aims at preparing its pupils for direct entrance into industry. The children in this group as well as all who have separated themselves from the all-day school have another opportunity for study in the evening classes which are provided in most communities.

In these evening classes, courses of study are organized to cover four or five years. The first two years are spent in an evening continuation class, this work being done, usually, in an elementary- or secondary-school building. For boys engaged in industrial work, these schools provide the same type of training as the pupils would have received had they remained in the all-day junior technical school.

If a boy has completed the all-day junior technical course, or if he has completed its equivalent in the evening continuation school, he then proceeds to the senior technical course. At this stage the industrial courses are specialized to fit into the needs of the local industries.

While a close coördination exists between the affiliated schools and the central technical schools in Scotland, no such coördination exists in England between the smaller technical schools and the larger ones in which students may work for a degree. This lack of coördination naturally has led to the setting up of a great number of standards. It was found that the schools in the suburban towns and even some of the schools in the larger cities are under an entirely separate administration. The result of this is that the larger central institution has no control over the curriculums of the smaller schools where the demands for advanced work is rather limited. This makes the passage of the student from the smaller to the larger school rather difficult, owing to the fact that he must pass an entrance examination for which he may not have been prepared.

(To be continued)

Organization of Auto Mechanics at the Jackson Intermediate School

*Roy H. Gould**

Purpose of the Course

IN harmony with the general aims of intermediate-school education, the course in auto mechanics is designed to give exploratory experiences in the field of automotive construction, care, and maintenance. It is in no sense a trade course and, therefore, no attempt is made to teach automobile repair.

The work is so arranged as to teach the main mechanical, electrical, and thermal principles involved in automobile mechanics, rather than specific manipulative skills. The course should be equally helpful to the prospective automobile operator, salesman, or repairman.

*Jackson Intermediate School, Detroit, Michigan.

General Method

The type of class organization may be characterized as individual instruction, employing the laboratory method. The rate of individual progress is dependent only upon the ability of the pupil to follow instructions, make his observations, arrive at the proper conclusions, and record these conclusions. Provision is thus made for individual differences.

Shop Layout

The shop may be considered as divided into two parts. In one part the observations, tests, and experi-

ments are made on actual automotive assemblies and parts, such as, chassis, engines, differentials, axles, wheels, transmissions, ignition systems, camshafts, etc. These units are placed either upon special stands or upon individual benches, making possible the grouping of pupils about each job.

The other part of the shop is equipped with tablet-arm chairs for writing up the jobs after the manipulative and study work has been accomplished. This arrangement relieves shop congestion, as some pupils are sitting down and writing while others are working at their benches.

The Job Sheets

Hanging on a hook at each bench or unit of work are two typewritten sheets, letter size, mounted on sheet-metal backs for rigidity and covered with celluloid fronts for preservation. One of these sheets may be termed the *instruction sheet*, the other the *test sheet*.

The instruction sheet is made up under the following headings: (1) Name of Job, (2) Purpose of Job, (3) Equipment, (4) Tools, (5) Procedure. An attempt has been made in each job sheet to give such instructions as will lead the pupil to make certain definite tests and observations, and arrive at the desired conclusions. Only such factual information is given as is necessary in assisting him to make his observations intelligently and meaningful.

After having completed the work on the instruction sheet, the pupil turns to the question sheet which he takes to his seat. The questions are designed to test, for correctness, the observations and conclusions made while on the job. Each pupil writes the answers to the questions in his notebook, making each answer a complete statement, incorporating the question and answer so as to make intelligible reading for review purposes. He is then ready for the *student instructor's* O.K. which is taken up under the next heading.

The Instruction Group

The class is divided into crews or groups of three pupils each. Assuming that instruction is under way, one of these three pupils in each crew is a student instructor or foreman. He has done the work and had his questions checked by the instructor and is thereby qualified to teach the job to two other boys. When the first of these two finishes his work and questions, the foreman checks his notebook, requiring any necessary corrections to be made. The boy is then ready for the next job. When the second boy finishes his work the foreman checks likewise his notebook and instructs him that he is now to become foreman and must, therefore, get the teacher's O.K. When the teacher's O.K. is obtained, this second boy becomes foreman and the original foreman is ready for a new job.

This plan provides that each pupil shall, after having completed his work, teach two other pupils, thereby giving him a review which should clinch in his memory the principles of the lesson involved. All pupils are taught some of the methods of teaching and urged to think of themselves as teachers while acting as student instructors. It is hoped that to some pupils special interests and abilities may be revealed, that will turn them toward the teaching profession.

The service of recording the work of individuals and routing them on to new jobs is handled by a pupil

AUTO-MECHANICS SHOP, THE JACKSON INTERMEDIATE SCHOOL, DETROIT, MICHIGAN

whose duties extend over a period of one week, credit being given for the service. He has, hanging before him, a sheet about 20 by 30 in., ruled off into ½-in. squares. Along the left edge of this sheet are listed some fifty-odd jobs, each bearing a number. Along the top edge, written vertically, are listed the names and numbers of the pupils in the class. Thus by following across the page on a line with any job, a square may be found directly below a given pupil's name. When a job has been finished and properly checked, the pupil presents his notebook to the recorder or *superintendent* who fills in the proper square under the student's name, and then finds a vacancy for the pupil to fill. He does this by referring to the record sheet, for as each boy is given a job, the date on which he is given that job is placed in the square opposite the job and below his name. Thus by running his eye along the horizontal lines, the recorder must find a job on which only two boys are working (indicated by the dates of starting). This task is simplified by placing a thumb tack after the job name immediately when a job is made vacant. When the vacancy has been located, the recorder writes the date in the square below the boy's name and on the job line, and gives the new job to the pupil in question.

The record sheet thus tells the following things: The name and seat number of each pupil, the list and numbers of the jobs to be done, the number of jobs each pupil *has* done, how many pupils are on each job, and which pupil is foreman (oldest date) of each job. It will be seen that to work 39 boys, only 13 jobs need be worked on, with, perhaps, one or two extra jobs for flexibility. When a certain job has been completed by all the boys of a class it is closed out and a new one put into play.

Core Jobs

In selecting the instructional material in auto mechanics, it becomes obvious that certain of the jobs are more important than others. Inasmuch as all boys do not complete all of the jobs, due to individual differences in ability, it seemed advisable that an attempt be made to point out the jobs that cover the major principles of mechanical operation and maintenance of the automobile and set them up as the first work to be accomplished. There are some twenty such jobs, and they are termed *core jobs*. These must be finished before going on to less-important phases of the work. It has been found that the average pupil has no difficulty in covering the core jobs, while an exceptional boy may do as many as fifty jobs in a term.

Examinations

At the end of each semester an examination of forty questions is given. The questions are selected at random from the core-job question sheets. Before test time the pupils review their notebooks, which by that time, should consist of from 400 to 600 statements of fact concerning the work covered. They become prepared, by reviewing these facts, to answer the examination questions.

The Toolroom

With this type of organization a comparatively small selection of tools serves adequately. These tools are hung on hooks or screws against a dark-colored inclined backboard. The outline of each tool has been painted on the board in a light color. The tools are hung over their respective outlines.

When a pupil requests a tool, he gives his seat number to the tool boy, who removes from a check rack a metal check with the corresponding number stamped on it, and hangs it on the tool hook in place of the issued tool. At clean-up time it is easy to see which tools have not been turned in and to place the responsibility for them.

The tool boy is on duty for one week, during which time he becomes familiar with the tools through a special job sheet. He is given regular credit on the record sheet for this duty.

Grading Pupils

At the time of each card marking, the number of jobs each boy has completed is counted from the number of filled-in squares on the record sheet. The median is found from the results thus obtained, not on the basis of each separate class, but on the basis of the records of all classes in that particular grade. Thus, as an example, if there happen to be three 9A classes of varying mental ratings, as may be expected under the plan of homogeneous grouping, the median for all will likely be above the median for the lowest group. This plan precludes the possibility of a pupil of low mental rating receiving a mark of A unless he has done as much work as the best pupils in all the 9A classes. The median number of jobs is considered as C work, and other marks are arranged accordingly. There is no room for failure, however, as long as a pupil's attitude is right, because in this organization the work can be adjusted to the level of any pupil, who successfully has come up through the grades.

The Demonstration

As a coördinating element of the foregoing shop *set-up* a ten-minute demonstration period is provided at the beginning of each class hour. During this period the instructor takes up each job in its turn, making such explanations as are found necessary to supplement the job-sheet instructions. It is during this period also that any questions are brought up concerning the work of the past day. Pupil participation in the discussions is encouraged. It is at this time that the personality of the teacher is felt and the way is cleared for creative pupil effort.

It will be seen that in such a plan as has been described, there exists a great opportunity for the development of desirable characteristics, such as coöperation, honesty, a workmanlike attitude, and the ability to stick to a job until it is successfully completed. There also exists the possibility of a troublesome but bright boy obtaining the same high mark as another bright boy, who has a finer sense of social adjustment.

To give credit to the latter type pupil, and to discourage undesirable attitudes, the following means is applied. If a pupil has worked diligently and stuck to his job in an approved manner, his foreman signs his name at the *top* of his notebook as an O.K. If, however, the pupil has been troublesome in any way, the foreman writes O.K. and his initials *across* the written work of the page on which the test questions have been answered. When a notebook thus checked is presented to the recorder, he sends the pupil to the instructor, who tries to make him see how he is defeating his own purpose. The pupil then goes back to the recorder, who places a blue cross in the job square instead of filling it in in red. The pupil is then given an opportunity to work off his misdemeanor and have the cross filled in as soon as he has shown a desire to conform to the rules of class conduct. If he fails to do this, the square is filled in with blue, and his mark in effort, which appears on his report card, is lowered accordingly.

An effort is made to refrain from placing on the record sheet a conduct mark that cannot be worked off, as it is development rather than punishment that is sought.

In order to offset the demerit system, a reward or merit is offered for acts of special value to the organization. Repairing equipment without being requested to do so, making suggestions of practical value, such as placing of equipment for greater efficiency and bringing in units for class use, are examples of the spirit rewarded by the merit system in use. This type of thing gives the members of a class a better appreciation of the equipment in the shop and produces the kind of coöperation that will carry on after leaving school to make more successful wage earners.

The merit is recorded by means of a red check in the proper space on the record sheet. It is taken into account at card-marking time, applying on the effort or attitude mark.

Outside Work

In order to stimulate the carry-over value of classroom instruction, recognition is given for work done at home. Each boy who contemplates assisting in the repair of an automobile away from school may secure from the instructor a form on which is listed a number of suggested jobs and a space for any additional jobs the boy might do. A space is also provided for notes, such as difficulties encountered. After having done the job, the boy obtains the signature of the person he assisted and presents the form to his instructor, who credits the boy on the record sheet in the space provided for *outside work*. A contact with the home is thus made which strengthens the relationships between parents and school, in addition to being productive of worth-while pupil stimulus.

Mental States other than Intelligence that cause Work Accidents

*Max S. Henig**

THE few investigations that have recently been made into the mental causes of work accidents have concerned themselves chiefly with the general intelligence of the injured worker.[1] This is the natural result of the existence of several fairly reliable objective measures of general intelligence. Either because of the recency of interest in this phase of accident prevention or because no suitable objective measuring devices exist, nothing has been done to discover with equal definiteness what are the other mental causes of work accidents. Several studies have been made, it is true, to learn whether fatigue was an element in accident causation, but no definite relation was ever discovered.[2] Obviously, none but the unfortunate worker knows whether or not he was fatigued at the time he was injured. Though a well-conducted investigation[3] shows that those who most frequently visit the plant hospital because of minor illnesses also most frequently meet with work accidents, this is not the same thing as discovering that illness causes accidents. The only person, in short, who can authoritatively state what were the mental conditions that accompanied or provoked an accident is the victim himself.

The following is a statement of an investigation into the mental causes, other than general intelligence,[4] of work accidents that was based on this fact. The study covered a period of three years and was made at the West Orange unit of the Essex County (New Jersey) Vocational Schools, where apprentices in various trades receive shop training. The method used was that of guided and controlled introspection, which alone can give the investigator thoroughly trustworthy knowledge of those psychological and psychophysical conditions that are actually operative at the time of an accident.

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[1] Henig, M. S., "Intelligence and Safety," *Journal of Educational Research*, Vol. XCI, No. 2, (Sept., 1927).

[2] *Two Contributions to the Study of Accident Causation*, Medical Research Council, Report of the Industrial Research Board, No. 19.

[3] Newbold, E. M., *A Contribution to the Study of the Human Factor in the Causation of Accidents*, Medical Research Council, Report of the Industrial Research Board, No. 34.

[4] For information on this aspect of accident causation, see Henig, M. S., "Intelligence and Shop Accidents," *Industrial-Arts Magazine*, Vol. XVII, No. 8 (Aug., 1928).

The procedure was as follows: Each accident[5] victim, as soon as his injury had been treated and he had been put at ease physically and mentally, appeared before the investigator. There followed an informal talk during which, largely by means of a series of questions requiring only a "yes" or "no" answer, the injured person was helped to recall the immediate, material causes, and the secondary or mental causes of the mishap. The questions were such as to lead the person who had met with an injury, to reveal his understanding of the possibilities of the occurrence of the accident he had met; the extent to which he was experienced in the performance of the operation at which he had been injured; whether or not he had been fatigued or in pain; and others of like character. After such an interview, the investigator had as authentic a record of the mental processes and equipment of the injured apprentice at the time of his mishap as could possibly be obtained; authentic because supplied by the only person who could do so — the injured worker himself.

In the three years during which this procedure was followed, 148 accidents were reported and the injured person interviewed.

Table I presents both the form used and a summary of the findings of these interviews:

TABLE I
Personal Reports of Causes of Accidents

	Yes	*No*	*Total*[6]
1. Were you ever warned against this particular accident?.....	66	80	146
2. Have you ever before			
a) Done this work?.....	96	38	134
b) Operated this machine?....	11	2	13
c) Used this tool?.....	83	3	86
d) Performed this operation?..	96	31	127
3. Were you listening to anyone at the time?.....	15	119	134
4. Were you talking to anyone at the time?.....	9	134	143
5. Were you looking at someone or something other than the job?..	19	122	141
6. Did you realize at the time that this accident was possible.....	55	93	148
7. Were you tired at the time?...	1	137	138
8. Were you suffering from a headache, toothache, or any other ailment?.....	0	140	140
9. Were you worried about something at the time?.....	0	140	140
10. Had you been working more rapidly than usual?.....	24	117	141

The data shown graphically by Figure 1, which is practically a profile of some of the mental causes of work accidents, make it possible to get a new and trustworthy insight into several of the mental causes of industrial accidents. The following is an item-by-item commentary and interpretation of the findings and their implications for industry:

1. *Ignorance* of the hazard involved accounts for 55 per cent of the total number of mishaps. This is, perhaps, a somewhat higher rate than prevails in industry, if for no other reason than that the vocational school apprentices' tasks are more varied than those assigned to industrial workers. On the other hand, these apprentices were more completely protected by safety education, safeguarding, and the various other elements of an exceptionally thorough safety program than the average wage-earner experiences. Ignorance of the hazard is, in all probability, one of the major mental causes of industrial accidents.

2. The fact that in seven cases out of every ten, as is indicated by items *2a* and *2d*, training had been given in the performance of the job at which the apprentice was injured, indicates that *skill*, the ability to make the neuro-muscular coördinations required by the job, is not, by itself, a guarantee against work accidents.

3. These same items, *2a* and *2d*, do, however, reveal a psychical factor of accident causation to be reckoned with. Since, according to school rules, work was to be done only after instruction and permission had been

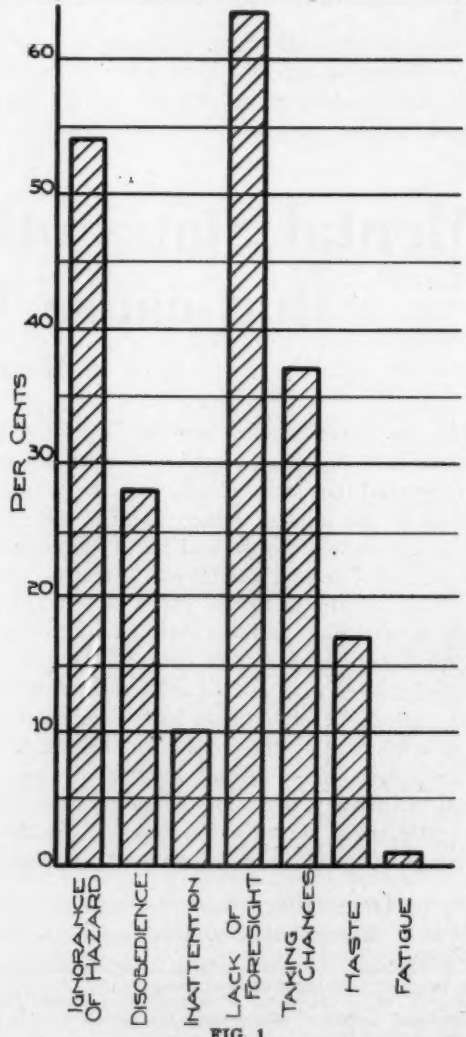

FIG. 1
Mental causes of Work Accidents, expressed in per cents. Data based on 140 cases.

[5]The definition of an accident adopted for this investigation says: Every mishap that results in an injury which requires treatment is a reportable accident. Every injury that presents the possibility of infection must receive treatment.

[6]The lack of agreement in the totals is caused largely by the circumstance that all questions did not apply to all cases.

given, the fact that approximately three out of every ten accidents occurred on jobs for which neither permission nor instruction had been given, proves that *disobedience* is another of the mental causes of work accidents.

4. Items 3, 4, and 5 were used to discover to what extent *inattention* was a cause of accident. It contributed to approximately 8 per cent of the mishaps. Inattention, it would appear, may well be banished from the position it now holds in the minds of most safety engineers as the chief mental cause of work accidents. It is fit only to take a place with *carelessness,* which now is well on its way to oblivion, as far as its being considered a potent factor in accident causation. Erroneously accepted as outstanding among the mental causes of accident, first *carelessness* then *inattention* has been unduly emphasized.

5. As might be expected, both because no one incurs even a slight injury willfully, and from the large percentage of injured apprentices who professed ignorance of the hazard involved in the operation that caused the mishap, *lack* of *foresight* was an important predisposing factor. According to item 6, 64 per cent of those who were injured had not at the time foreseen the dangers involved in the particular operation that culminated disastrously for them.

6. Equally significant is the condition revealed by the other aspect of the replies to this item. Thirty-six per cent of the accidents occurred, despite the fact the danger was foreseen. *Foolhardiness,* willingness to take a chance, is a cause of many accidents.

7. Fatigue, illness, worry, are three factors that lately have been accepted as the most frequently operative mental causes of work accidents. According to the answers given to items 7, 8, and 9, fatigue, illness, and worry practically never induce an accident.

This conclusion is not to be discounted on the grounds that these apprentices are never pushed hard enough to become fatigued; that they suffer no major illnesses, or that they have no worries. Though these boys are not exploited for production, the standards set press them well toward the limit of their ability and capacity. The number absent and the number excused each day for illness in all probability exceeds by far the record of any numerically comparable industrial establishment. As far as worry is concerned, the difference is one of cause rather than of degree. Fatigue, illness, and worry do not here show up among the mental causes of work accidents simply because they are not effective as such. The boy who is worried, ill, or tired is not hurt, mainly because he doesn't work. He *soldiers* on the job. Human nature being what it is, the chances are overwhelmingly in favor of the same condition holding true in industry. Fatigue, illness, and worry may induce malingering; it has never been proved they cause accidents.

8. *Hurry,* it appears, since approximately one out of every five of the apprentices injured admitted he had been rushing the job, is also a factor to be reckoned with in setting up a program for removing or alleviating the mental causes of accidents. This finding agrees with the result arrived at from a much more extended study recently made in England, which showed that the hourly incidence of accidents during the working day rose and fell in harmony with the production curve.[7]

As has already been explained, the foregoing analysis concerns itself only with some of the psychological causes of work accidents. It is, however, the opinion of the investigator, based on the interviews that were the major part of his study, that none of them is ever, in itself, the cause of an accident. These and others not studied in this investigation overlap and interweave to form a complex, a mental "set," or attitude. It is this complex, whatever its core or dominant idea, that is responsible for the accident.

Implications for Industry

The data, as has already been stated, were assembled in a vocational industrial school, consequently whatever implications they present for the industries must be considered in that light. This caution does not necessarily imply that these findings should be heavily discounted. After all, though the vocational school does not approximate industrial conditions in regard to production, specialization, character of personnel, and payment of wages, yet it approaches them in equipment, tools, processes, type of work, and even quality of workmanship. It is making a safe prediction to assert that any future substantial or conspicuous forward step in industrial accident reduction will be based on work, largely of a prognostic and preventive nature, with each individual employee. The degree of susceptibility to accident of each worker can now be determined.[8] This procedure may well lead to the device of assigning workers to jobs on the basis of their inherent relative freedom from accidents, or, when this is impracticable, to a closer and more constant supervision of those revealed as prone to accident. Along with this more effective supervision might well go, as the data obtained by this investigator indicated, more definite and more thorough instruction in the hazards of the job and the job environment. Such instruction will need to be based, primarily on the accident experience of each particular industrial establishment, and secondarily, on the employee's ability and willingness to benefit from such teaching.

From the highly particularized point of view of accident prevention, personnel work will need to take on a new emphasis. Not that every effort toward preventing fatigue, worry, and illness are not decidedly worth while, but more valuable undoubtedly will be activities of such a character as will prevent the establishment among the workers of dangerous mental "sets" or patterns such as foolhardiness and the unwillingness to obey safety instructions.

[7] *Two Contributions to the Study of Accident Causation,* Medical Research Council, Report of the Industrial Research Board, No. 19.

[8] For information on this aspect of accident causation, see Henig, Max S., "Intelligence and Shop Accidents," *Industrial Arts Magazine,* Vol. XVII, No. 8 (Aug., 1928); also Farmer, E. and Chambers, E. G., *A Psychological Study of Individual Differences in Accident Rates.* Medical Research Council, Report of the Industrial Research Board, No. 38.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

CONSERVATION OF EYESIGHT

The National Society for the Prevention of Blindness is making every effort to interest the school in the pupil who is handicapped by poor eyesight. While much of its printed matter is directed to the school teacher of academic subjects, nevertheless the responsibility of trying to assist youngsters with defective vision is as much a duty of the shop teacher as it is of any other person in the educational field. Much needless suffering could be avoided, if every teacher, shop teacher as well as academic teacher, would assist in this battle against defective vision.

A point, not usually borne in mind by many teachers, was recently brought out by Dr. B. Franklin Royer, of New York, Medical Director of the National Society for the Prevention of Blindness, in one of the news letters issued by that organization. Dr. Royer says:

"The nearsighted child, it goes without saying, must always have his vision corrected with lenses. Glasses will not only enable him to see with less strain, but they will also prevent the nearsightedness from becoming worse.

"Teachers are sometimes distressed when nearsighted children, first getting glasses, show a constant desire to remove them in school. The reason is easily explained. The child sees better for close reading with his glasses off than with them on. There is usually no difficulty in getting a nearsighted child to wear glasses for distant vision, although they may find them troublesome on the athletic field.

"The teacher, however, should have a keen appreciation of why the glasses are worn for close work. The explanation usually given is that the nearsighted child needs to wear his glasses for close work in order to require the inside eye muscles to take such action as may be necessary to bulge the lens a little. It is this to and fro muscle action for bulging and then relaxing the lens that gives normal tone to inside eye structures, an end so highly desirable in preventing progress of the nearsightedness."

Shop teachers know from their own experience how much depends upon the eye when accurate work is to be done. Insistence, then, on sight correction for those who need it, and on adherence to the oculist's orders, at least while the afflicted student is in the shop, is a small but necessary part which shop instructors should accept as their function in the national fight against blindness.

Another thought may be connected with this particular phase of teaching work. The shop teacher should be thoroughly alive to his responsibility as the keyman in the vocational-guidance movement fostered by the school. Not only should he help conserve eyesight, but he should also counsel those who unfortunately are not gifted with healthy eyes against entering occupations which require continued and close application of that organ. There is probably no more pathetic figure than the man who has spent years in preparing himself for and working at a skilled occupation, only to find later in life that he no longer can carry on because of defective vision.

Verily, this question of the prevention of blindness is something that the shop teacher who is thoroughly alive to the full significance of his job may not overlook.

WHAT CAN BE DONE ABOUT IT?

The price of any commodity is dependent on a large number of factors. Not the least of the items that go into it, is the one that is chargeable to *selling expenses*.

Good salesmen are rare, and they command salaries that are commensurate to their standing in the merchandizing field. Most equipment manufacturers feel that the school field requires a higher class of sales personnel than does the general merchandizing field, hence they go to considerable trouble and expense to employ men who can sell, and who also can properly represent the home office. In recognition of this extra service, it might not be amiss to point out how the school could reciprocate and make the matter of selling a little less arduous for those who have to compete for school orders.

Conservation of time is always important. One phase of it has already been mentioned in the editorial entitled "Fair Treatment" which appeared in last month's issue of this magazine. But there is still another side to this story, in which the time element assumes a much weightier aspect than the one mentioned. Probably a way out of the difficulty might be more readily seen if the process of selling to some school boards were first pictured.

Imagine that a rather important piece of equipment is to be bought. The salesman must first sell his article to the instructor, who is after all, the man who uses the equipment. Then he must call again later to sell it to the supervisor. Often the principal also insists on being a party to the transaction, and he is the next man who must be visited. But even after all of these men have been sold, the salesman's labors are not over, for if he wants to be sure that the proper consideration be given to the item which he is offering, he must visit and explain his proposition to some, if not all, of the members of the board of education, and then probably later on go over the entire ground again with the man who does the purchasing for the school system.

Such a vast amount of duplicated effort must necessarily increase costs. Can something be done to relegate these tactics of antiquity to the scrap heap where

they belong? Surely, such an absolute waste of time is not to be countenanced. It is so unnecessary and bespeaks such poor management. The school which ought to set standards for the community is the last organization which can properly permit the charge of inefficiency in business matters to rest upon itself.

Probably, someone connected with one of the many school systems that have worked out their purchasing methods on a businesslike basis can find an opportunity to educate the erring brethren, and thus bring about a much desired reformation from which both school and business will derive great benefit.

CLEAR THINKING

Every profession demands clear thinking of its followers. If this is true, the teaching profession may undoubtedly be said to demand it more of its devotees than does any other profession, because the product of the school exerts such a tremendous influence on not merely one life but rather the lives and the destinies of practically everyone living under modern conditions.

Every teacher, then, must necessarily be interested in what is meant by clear thinking, and a perusal of some statements made on this subject several years ago by Mr. Craig B. Hazlewood, then president of the American Bankers Association, in an address before the New York Chapter of the American Institute of Banking, may be very enlightening, even though the words, when uttered, were meant to apply to those engaged in an occupation quite different from teaching.

Mr. Hazlewood, in outlining the five essentials of a sound thinker, said:

"If I were looking for a young banker of exceptional promise, I should hope, first, to find in him the simplicity to wonder. Every great advancement in banking and business has been made by men who dared to wonder, who had the courage to inquire into present procedure, and who had the audacity to ask whether something that had been done a certain way for a long time might not be wrong. Although the history of America's progress from its very discovery to the present time has shown the value of an inquiring mind, there is still an inevitable tendency in most men to accept in a docile manner the opinions, methods, supposed facts, procedures, and processes of the past. With due reverence to the effort, the spirit, the accomplishments of the past, let us make it our rule that everything be looked at with the clear, questioning eye and mind of the scientist. 'The man who cannot wonder,' said Carlyle, 'is but a pair of spectacles behind which there is no eye.'

"Second, among the essentials for sound thinking, I would write down an open mind. We have mentioned freeing our minds from the influence of tradition. Let us think also without prejudice of personal feelings, desires, or consequences. Let us seek only the truth. Let us remember Emerson's statement that only the great are inconsistent. Mere surface reasoning must be discounted. Old "can'ts" or "don'ts" must be thrown into the discard. A man who has an open mind will do a great many things because he doesn't know they can't be done.

"The third essential to sound thinking is knowledge —a thorough, comprehensive understanding of all the factors involved in a problem. It has been said that most problems answer themselves when the facts have been gathered. A well-known student and teacher of business describes the method of attacking a problem as tearing it down, reassembling the problem, and drawing the conclusion. In reasoning, as in mathematics, there can be nothing but guesswork or intuition unless the unknown quantities are first discovered. No banker can be simply a banker. He must be a scholar, a tireless student, and he must 'drink deep or taste not the Pierian Spring.'

"As a fourth essential, sound thinking requires the capacity to generalize. How often we have seen men sweating and confused before a mass of details which they were utterly unable to classify and crystallize. In banking as in law, we have this problem of sorting out the relevant, attaining a perspective, and reaching a conclusion that can be defended against any attack. To certain minds this procedure comes naturally; to others, training in the solution of complicated problems points the way out.

"Fifth among the essentials of sound thinking is the power to apply. Wonderful as is the mind of man, it is not always controllable or obedient. A few individuals have minds that travel at random or in circles. Some have minds that even refuse to budge. But there are still others who naturally or through training have minds that can be directed straight through to the practical application of their thoughts. They refuse to compromise or to be thwarted in purpose before definite application of their ideas has been achieved."

How education would advance if every teacher had:

1. The simplicity and the audacity to wonder.
2. An open mind.
3. A comprehensive understanding of his problem.
4. The capacity to generalize.
5. The power to make practical applications of his ideas.

STANDING STILL

He who is silent is forgotten: he who abstains is taken at his word: he who does not advance falls back: he who stops is overwhelmed, distanced, crushed: he who ceases to grow greater becomes smaller: he who leaves off, gives up: the stationary condition is the beginning of the end.—*Amiel.*

SUCCESS

If you wish success in life, make perseverance your bosom friend, experience your wise counselor, caution your elder brother, and hope your guardian genius.—*Addison.*

Shop Kinks

*William L. Hunter**

THE shop teacher should be constantly on the alert for ideas which will make his job less difficult. A few follow which have at times made my work easier. Perhaps you, too, will find them usable.

Figure 1 shows a small twist drill being tempered over an alcohol flame. Boys in the woodshop have a tendency to break drills, especially when using a hand drill. It is safe to say that twenty drills are broken in the school shop to one which is actually worn out by wear and sharpening. If, then, a short half inch on the cutting end of the drill is left hard and the remainder is softened so that it is no longer brittle, there is every reason to expect that the drill will last considerably longer. A small piece of waste is dampened in water and this is wrapped around the point of the drill. The remainder of the drill is then held over an alcohol flame, or other source of heat, until the drill turns blue. Then let the drill cool slowly and it is prepared for a longer life of service in the school shop.

Figure 2 shows a slipstone suspended from a chain. A slipstone is very brittle and needs to fall but once to have its useful career ended. The writer used to have from three to five stones broken a year, but since he has them suspended from a chain, he finds that one stone lasts from three to five years. Considerable patience is needed to drill the hole through the end of the stone for the ring. This is best done by drilling from both sides of the slipstone, with a steel drill that is frequently sharpened and revolved very slowly. Considerable pressure should be used. After the stone has been supplied with a chain, it may be hung near the lathe where it is often used for honing the inside of turning gouges.

Figure 3 shows a common marking gauge, one end of which is adapted especially to the marking out of mortises and tenons. The two points are permanently spaced. In this way a tenon may be made today, a mortise tomorrow or vice versa, and there is some guarantee that one part will fit the other. Boys have difficulty in setting marking gauges with sufficient accurateness to make a good fit of the mortise and tenon, especially is this so if all the mortises and tenons are not marked out with the same gauge setting. This kink simplifies the procedure considerably.

Figure 4 shows a kink for setting jointer knives. The front table is lowered slightly. The old knives are taken out and the sharp ones set approximately in place. A small piece of soft wood approximately

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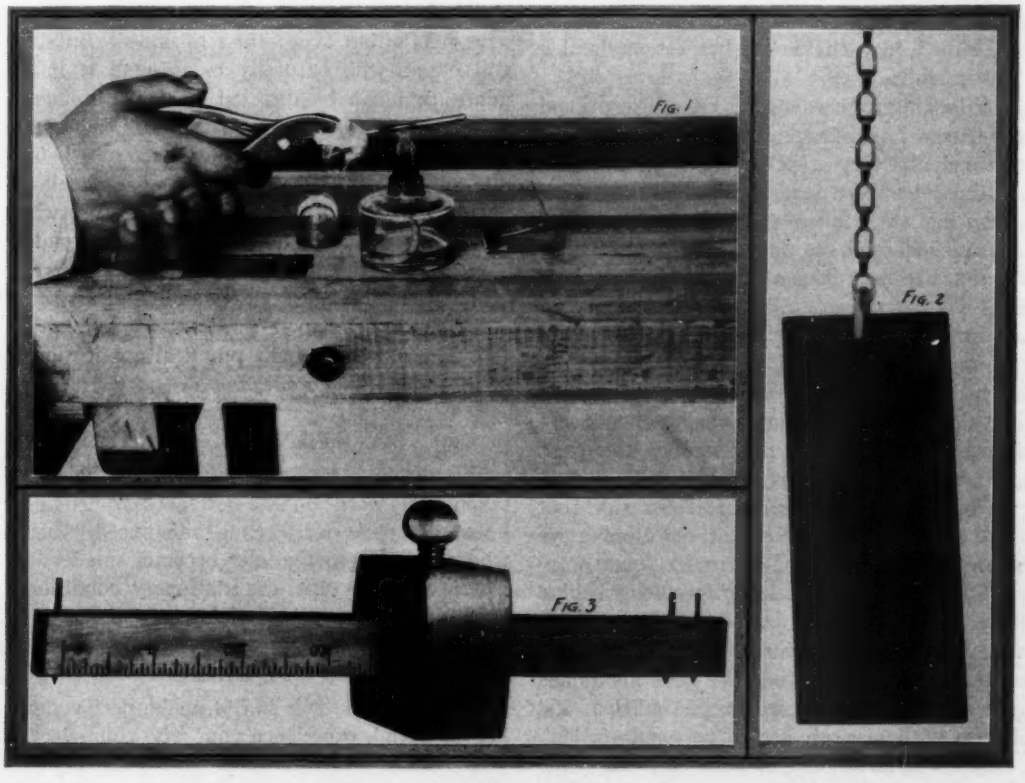

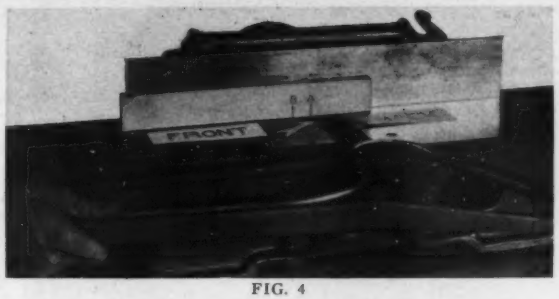

FIG. 4

¾ by 2 by 14 in. is then placed on the front table, as in the illustration. A mark "A" is placed on the piece of wood and this mark is made to coincide with the edge of the throat opening of the jointer. The jointer head is then given a partial revolution by hand, and the sharp knife, catching the piece of wood, carries it a short distance toward the back table. Line "B" is then placed on the piece of wood to mark the distance which it was carried by the sharp blade. Each knife is then set at both ends and center to carry the piece of wood the same distance, and when this is accomplished the knives are all set the same height and parallel to the front table which is necessary if an accurate job of jointing is to be done with the surfacer.

FIG. 5

Figure 5 shows an easy way to true up a grindstone. A loose bench is moved near the stone and a piece of gas pipe is fastened in the vise so as to act as a cutting tool for the stone. By slightly tapping the end of the gas pipe with a hammer from time to time the stone is gradually cut down until it is true.

Chicago Health and Educational Exposition

*A. G. Bauersfeld**

THE annual Health and Educational Exposition held at the Coliseum this year, was no doubt the greatest exhibit and demonstration of the work of the public schools ever staged in Chicago. Scores of senior and junior high schools, as well as hundreds of elementary schools, participated in this event. It is estimated that 1,000 children took part each day in the demonstrations which were held twice daily, at 2 p.m. and 7 p.m., in the various booths throughout the Coliseum and in the large assembly room.

It is estimated that 100,000 persons visited the exposition, and most of them obtained a real glimpse of what modern education offers to the children in the Chicago public schools.

Among the interesting exhibits was the popular Journalism booth, where a Chicago high-school associated press was manned by a staff from a different high school each day. The work of this group was then sent to the Tilden Technical High School printshop booth where a typical high-school printshop was in complete operation. Here a daily newspaper was printed, the page of which was about 10 by 12 in. It gave a full account of what was going on in the general assembly work of the north hall, and also described all of the special features which were daily changed in the 72 educational booths. The equipment for the printshop booth consisted of linotype machine, 14 by 22-in. platen press, composition table, paper cutter, proof presses, and three hand composition cabinets.

In the Calumet High School booth, the boys taking first-year woodworking erected a summer house, together with a complete line of garden furniture. In order to give these constructions a proper setting, a typical garden scene of a Spanish hacienda was painted on a large 10 by 35-ft. canvas. The summer cottage was placed on a terrace upon which a lawn was developed, the latter being surrounded by a border of colorful flowers.

The aviation classes of Lane Technical High School showed various processes needed in maintaining the efficiency of an airplane. Boys welded struts and braces with an oxyacetylene welding outfit. They demonstrated how patches were put on wings, and how various mechanical adjustments on the airplane motors were made. All of the different kinds of work that

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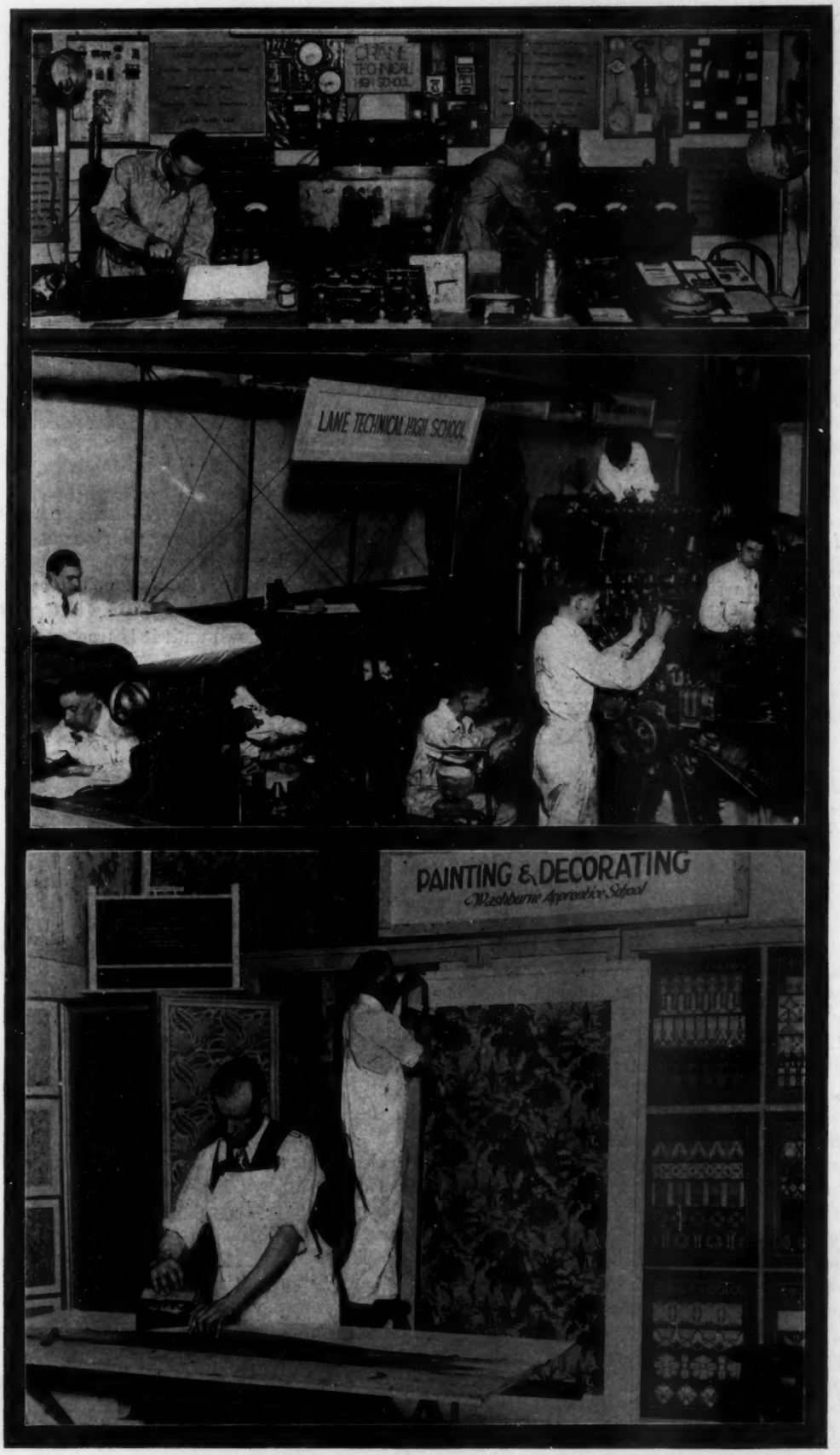


STUDENTS OF THE CRANE TECHNICAL HIGH SCHOOL DEMONSTRATING PROBLEMS IN ELECTRICAL CONSTRUCTION.
DEMONSTRATION OF AERONAUTICS AS TAUGHT AT LANE TECHNICAL HIGH SCHOOL. WM. SEARS, INSTRUCTOR.
STUDENTS OF THE WASHBURNE CONTINUATION SCHOOL FOR APPRENTICES,
DEMONSTRATING PAPER HANGING.

UPPER LEFT—A Typical High-School Printshop. Tilden Technical High School Students Turning Out a Daily Paper. Fred Maivald, Instructor.
LOWER LEFT—Messenger Boys from the Western Union Offices, Giving a Demonstration of How a Modern Telegraph Office Is Conducted. These boys attend the Hoyne Continuation School.
LOWER RIGHT—Journalism Students of Englewood High School Prepare and Edit Copy for the Daily Paper at the Coliseum.

might be included under the general heading of aeronautical ground work were shown.

The four-year electrical-construction department of the Crane Technical High School, demonstrated a variety of electrical devices that had been built in their shops. Among them was a telechrome clock, and the new popular solar light which produces the so-called "Florida tan" on people who never go south in the winter. A great number of other interesting projects also were displayed, such as electric motors, electric drills, soldering irons, radio sets, and toasters. Individual lesson sheets which the boys use in their regular course of study, and which call for the use of electrical instruments for measuring a.c. and d.c. currents, were included in this exhibition.

The development of artwork in the elementary, junior, and senior high schools was also illustrated. Demonstrations of every type of artwork were given, such as the making of posters, linoleum block printing, stencil cutting, batique work, clay modeling, sketching from life, applied design, and many other forms of art studies.

Selected groups of high-school students performed laboratory experiments in general science, biology, physics, and chemistry in the different science booths each day.

A large commercial-class exhibit included a typewriting classroom using the dictaphone method for receiving dictation, and a typical modern office completely equipped with all labor-saving devices such as bookkeeping machines, comptometers, multigraphs, and various filing devices.

There was also a most interesting demonstration of salesmanship by means of living models. The visitor was given inside information as to what constituted the making of a good sale on the part of a clerk, whether the article that was being sold, was a hat, a dress, or some other household article which can be found in a State Street department store.

In the north hall, definite assembly programs were given each day, including band concerts, R.O.T.C. drills, dances, vocal selections, orchestral renderings, dramatic sketches, style shows, and health lectures.

The results obtained in this educational exposition should make the citizens of Chicago feel that they have reason to be proud of their schools, notwithstanding the storms and strife which periodically arise in the educational life of a modern metropolitan city.

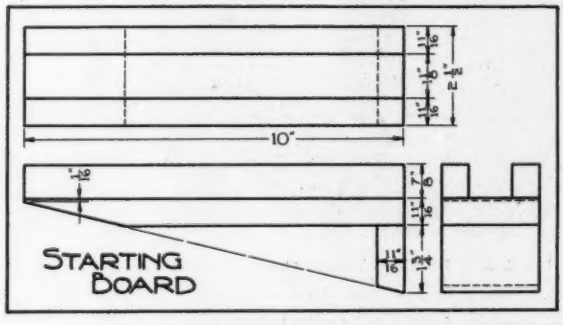
Motivating an Industrial-Arts Project

*Harry E. Wood**

CREATING an interest in producing good workmanship is just as important a factor in teaching as is the actual doing of good work. Recently, while visiting a seventh-grade woodworking class, I observed a device which stimulated vigorous competition so that each pupil tried to do the best work in the class. The teacher called this device the "inkwell" race.

The project which all members of the class had agreed to make was a circular base for an ink bottle. It was to consist of a disk of wood ⅞ in. thick and 5½ in. in diameter with a ¼-in chamfer around the upper edge.

To start the work, all of the students laid out the circle with a compass. The portions outside of the compass line were then roughed off with a saw, after which they were trimmed as near to the line as possible with a spokeshave. At certain intervals during the process of making the project "the race was called."



A starting board 10 in. long which had two ⅞-in. strips nailed upon it 1⅛ in. apart, as indicated in the accompanying illustrations, was elevated at one end on a 1¾-in. block. It was then placed on the floor at one end of the room in an aisle between benches.

The project of each pupil was placed on the starting board, in turn, and allowed to roll down the board and along the floor as far as it would go, staying within the boundaries of the aisle. Any flat portions on the circle, of course, retarded the movement of the disk and caused it to travel only a limited distance. If the edge of the disk was sloping, it would not roll straight, but would get out of bounds or fall over.

Each pupil was allowed only one turn on the first try-out. The eight disks rolling the farthest were considered qualified for the first lap of the race.

After an attempt to remedy any defects had been made, the second lap of the race was run, the eight pupils qualifying during the first lap acting as pacemakers. All other pupils regardless of their previous positions had their turns. Unless their disks rolled as far in this second lap as the distance recorded by the pacemakers in the first trial, the pupils were disqualified for the day. Again the eight to finish first (travel the greatest distance) without falling over or getting out of bounds were considered qualified in the second lap and their respective places were entered on the score book.

During the first attempts to qualify the thud-thud of the flat portions on the disks was referred to as "the engine missing" and when a disk rolled out of bounds it was said to "take to the ditch." If a disk failed to reach the distance covered by the pacemaker it was sent to "the pits" for repairs so that it could enter the next lap.

INKSTAND RACE

POSITION	LAP								
	1	2	3	4	5	6	7	8	9
1st Place	7	12	7	7	4	4	4	16	7
2nd Place	9	16	13	16	7	7	16	4	12
3rd Place	3	7	4	9	16	16	13	13	13
4th Place	13	17*	10	13	13	13	7	12	16
5th Place	11	4	11	10	11	†	12	7	4
6th Place	10	8	17*	11	12	†	9	11	9
7th Place	8	9	20	4	14	†	10	19	8
8th Place	6	13	18*	21	10	†	†	*17*	19

17* - wrecked 18* - wrecked *17* - new car
†- No more cars to qualify

The score card showed that good workmanship brought results, for in almost every lap of the race the same pupils attained approximately the same positions. Accidents happened in this kind of race as in other races, disqualifying the entrant. A glance at the accompanying score card will show that the pupil who attained eighth position in the first lap, by virtue of the position acting as pacemaker on the second lap, met with some accident in the second lap and did not qualify, but in the third he again kept his place in the qualifying number. It will also be noted that No. 7 maintained throughout the different laps, a place well toward the top of the score. An inspection of this pupil's work showed his disk to be an almost perfect circle and the edge to be extremely square.

The play part of this project took only a little part of the work period, and it paid big dividends in results in a desire for good workmanship.

INDUSTRIAL-ARTS EDUCATION

We must have opportunities for try-out and for guidance before a vocational choice is made, and before intensive vocational education is undertaken. Industrial-arts education serves as a background for vocational education. The need for vocational education is self-evident among thinking people.—*F. T. Struck.*

*Director of Vocational Education and Manual Training, Indianapolis, Indiana.

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A Dangerous Operation

The boy in the above picture is attempting to rip a disk.

In order to rip through the disk, the saw must be set high above the table, hence, as soon as the saw comes in contact with the wood, the disk will commence to revolve, and the operator's hand will be jerked forward into the path of the saw.

Never attempt this operation, it is too dangerous.

Safety Series—Roy R. VanDuzee, West Allis, Wisconsin

© Industrial Arts and Vocational Education

A Woodpecker Uses His Head When He Works

You, Too, Will Have To Use Your Head If You Want To Do Good Work

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Submitted by Jos. J. Lukowitz, Milwaukee, Wisconsin

TRACING SUPPLEMENT No. 198
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
JANUARY, 1931

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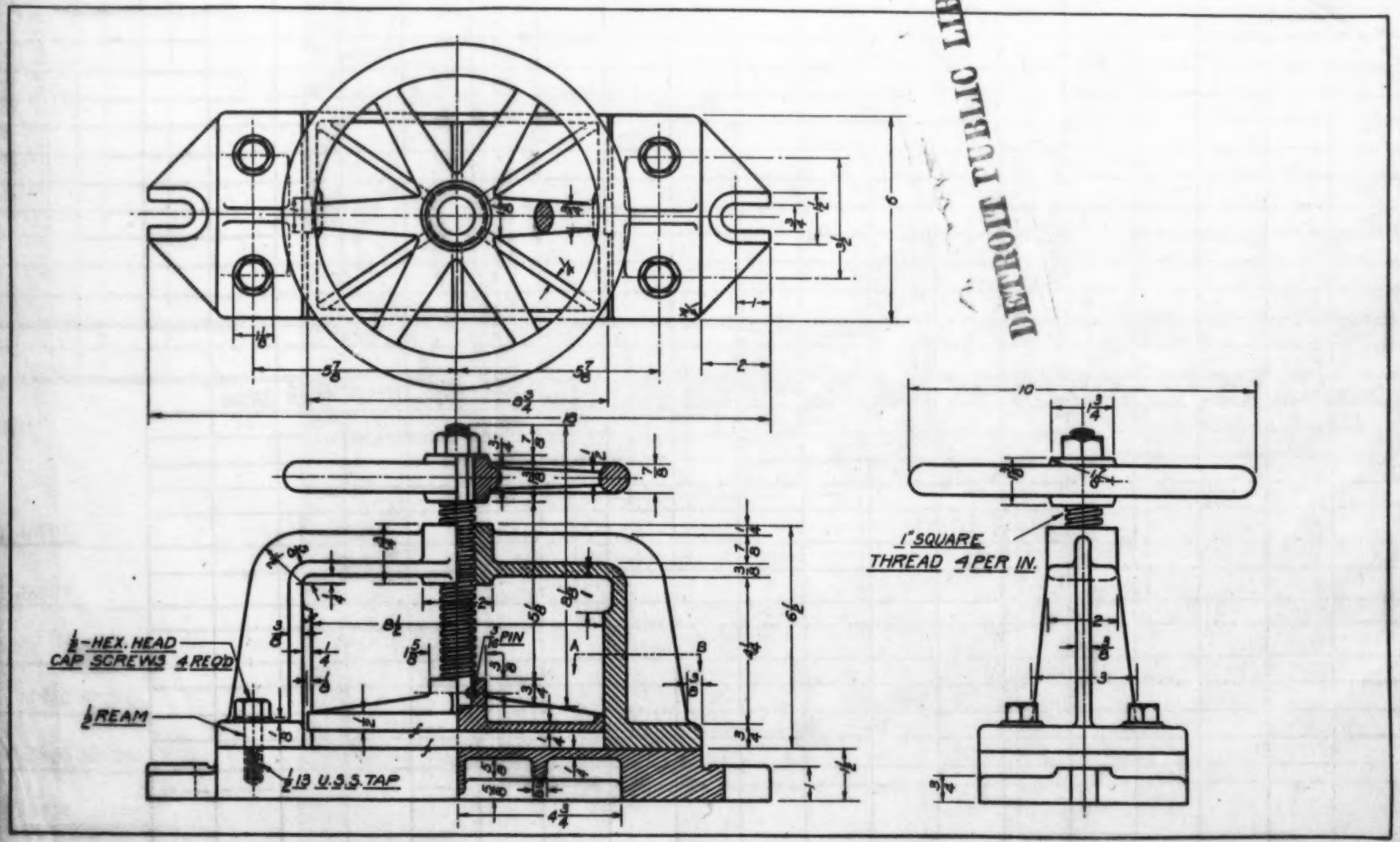

Screw Press, Designed by Wm. A. DeVette, Erie, Pennsylvania

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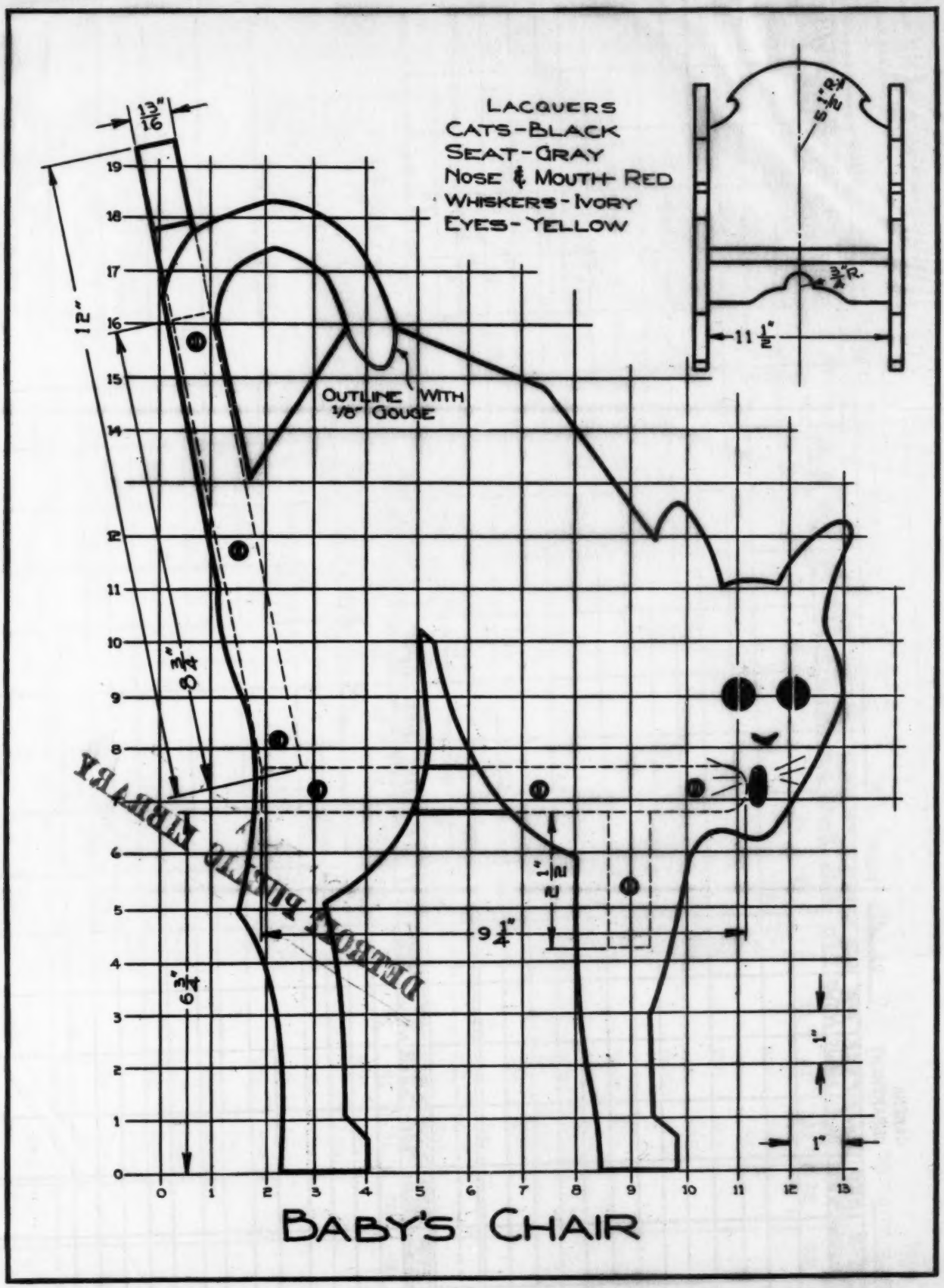

Designed by Frank E. Hardin, Peoria, Illinois

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CHART OF TYPICAL PROBLEMS IN RADIAL LINE DEVELOPMENT - BY C.H. DERBY & J.F. FABER

FUNNEL

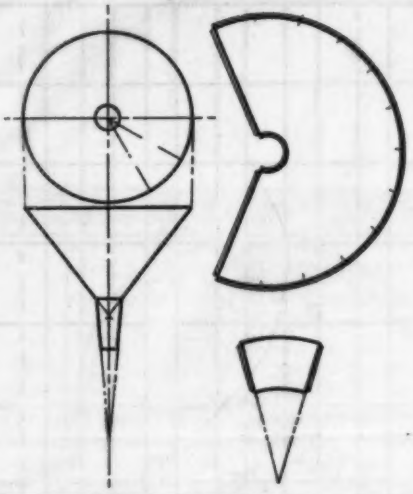
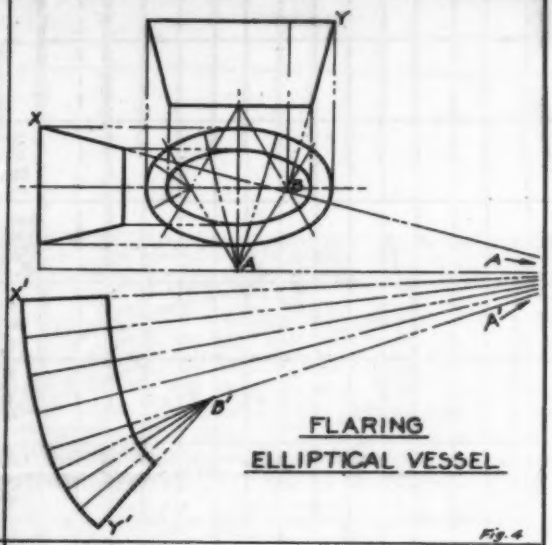


Fig. 1



FLARING ELLIPTICAL VESSEL

Fig. 4

ROOF COLLAR

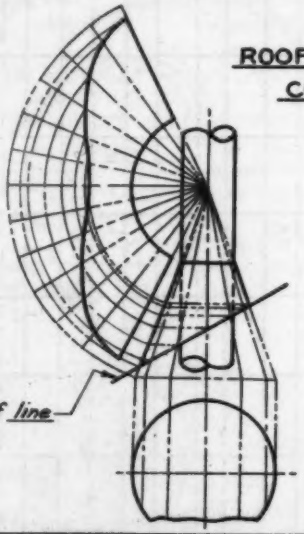
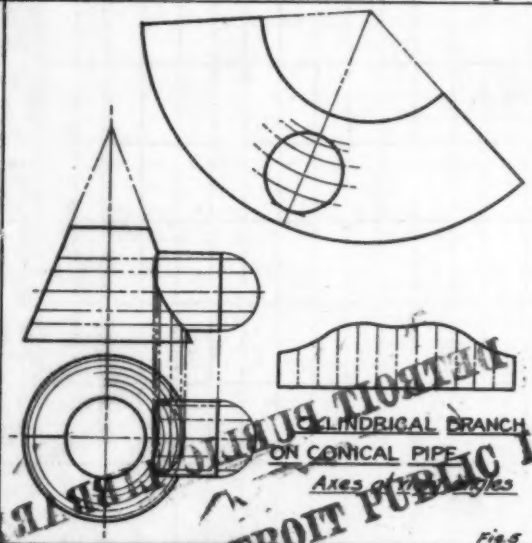


Fig. 2



CYLINDRICAL BRANCH ON CONICAL PIPE

Axes of ... angles

Fig. 5

CONICAL BOSS AROUND BRANCH ON LARGER PIPE

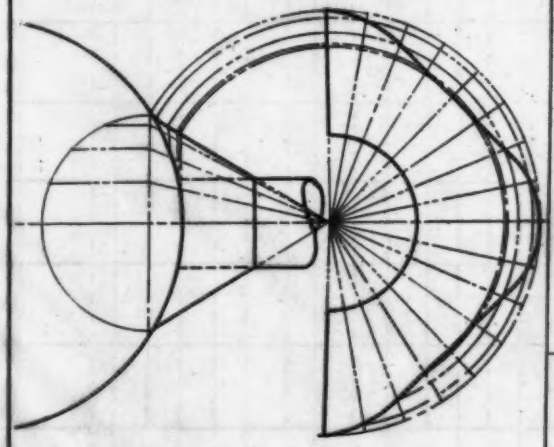


Fig. 3

CONICAL BRANCH ON CONICAL PIPE

Axes at oblique angle

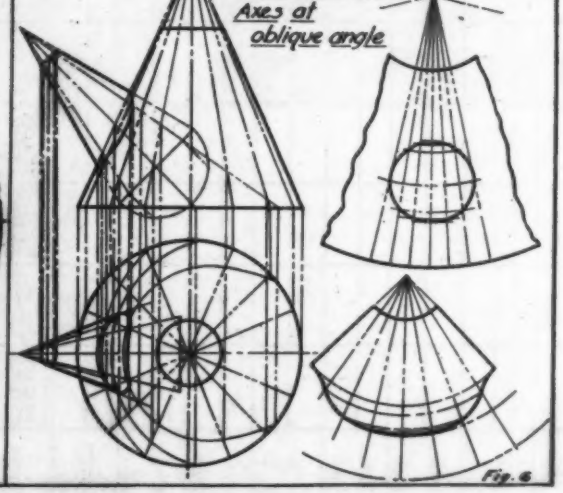


Fig. 6

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J. F. Faber, Erie, Pennsylvania

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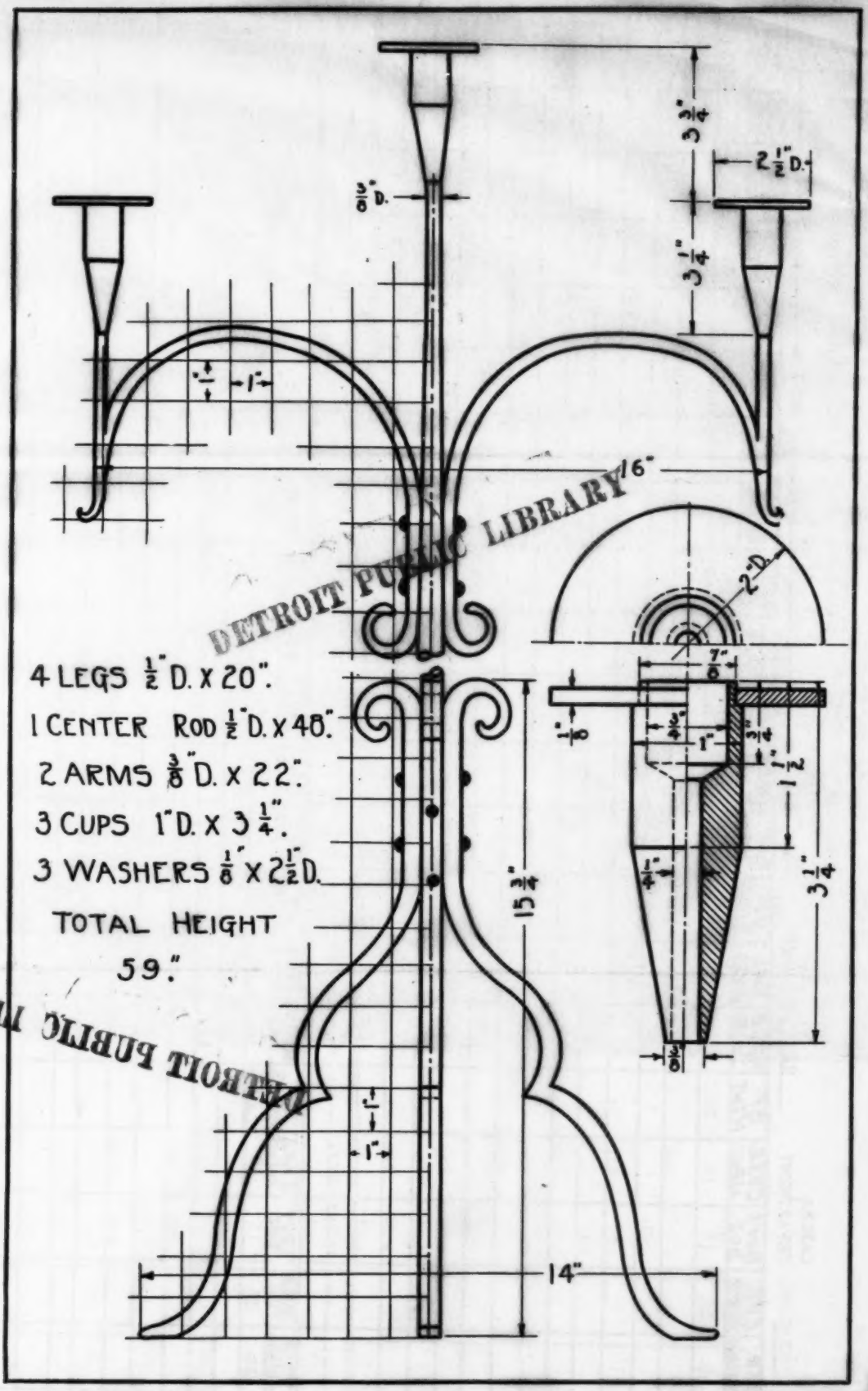

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Candelabrum, Designed by J. W. Bollinger, Tulsa, Oklahoma.

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PROBLEMS AND PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts and Vocational Education. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in woodworking, turning, patternmaking, machine-shop practice, sheet-metal work, forging, foundry work, auto mechanics, auto electricity, electricity, architectural and mechanical drafting, printing, bookbinding, concrete work, farm mechanics, home mechanics, and other lines of industrial-arts work are desired for consideration.

THE SCREW PRESS

Wm. A. De Vette, Wilson Junior High School, Erie, Pennsylvania

(See Supplement No. 198)

Drafting-room teachers frequently are on the lookout for problems which they can give to their students for detailing. The screw press illustrated herewith serves admirably for this purpose. It also may be used as a review and examination problem.

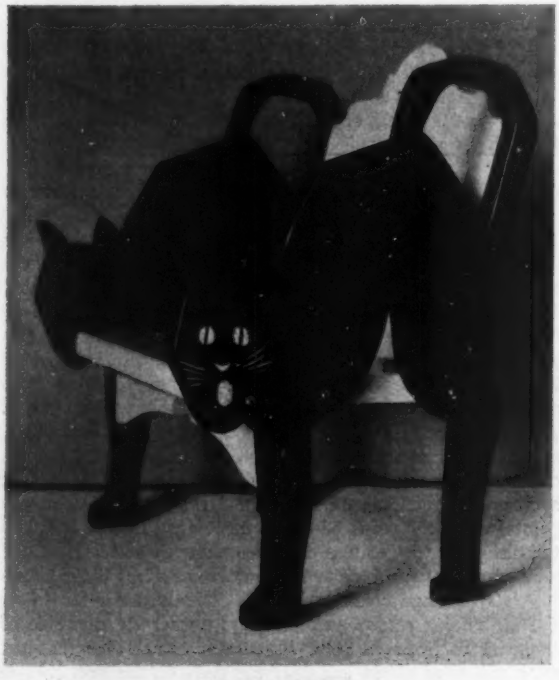
A BABY'S CHAIR

Frank E. Hardin, Manual Training High School, Peoria, Illinois

(See Supplement No. 199)

The little chair shown herewith was designed as a project for grade boys and has been successfully used both as a project and as a practical job for home use. The parts forming the sides, seat, and back were made of 13/16-in. stock (poplar) so as to make a strong and solid chair. All joints are butt joints, the parts being fastened together with r.h.b. screws. The arched tails make splendid handles for the baby to carry his chair about. They are strong and sturdy enough so that no damage is done if the chair is knocked over, or if it is used upside down.

Care should be used in the selection of a firm piece of material for the cats, with grain running vertically. The assembly should not be made until the various pieces have received two coats of lacquer, a third and final coat being applied after the assembly had been made. This insures a good finish that will stand abuse. One of these chairs which has been in use about three years, still looks capable to withstand the hard usage which it gets from its owner, a boy of three. It is alternately used as a footstool, a receptacle for all kinds of toys, and as a place to sit. The project makes an attractive piece for the home and is the cause of a great deal of comment by visitors.



BABY'S CHAIR

TYPICAL PROBLEMS IN RADIAL LINE DEVELOPMENT

C. H. Derby and J. F. Faber, Erie, Pa.

(See Supplement No. 200)

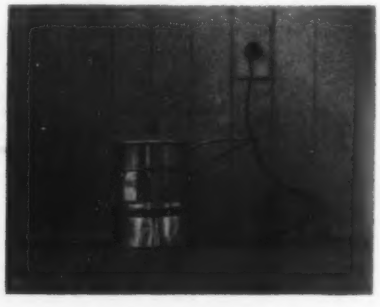
The chart entitled "Typical Problems in Radial Line Development" shows the methods used to develop the patterns for sheet-metal projects that are conical in shape.

These problems are of ordinary character and the necessary construction lines for the pattern development is shown in each case.

AN ELECTRIC GLUE POT OR DOUBLE BOILER FOR SHOP USE

E. A. Rerucha, Wakefield, Michigan

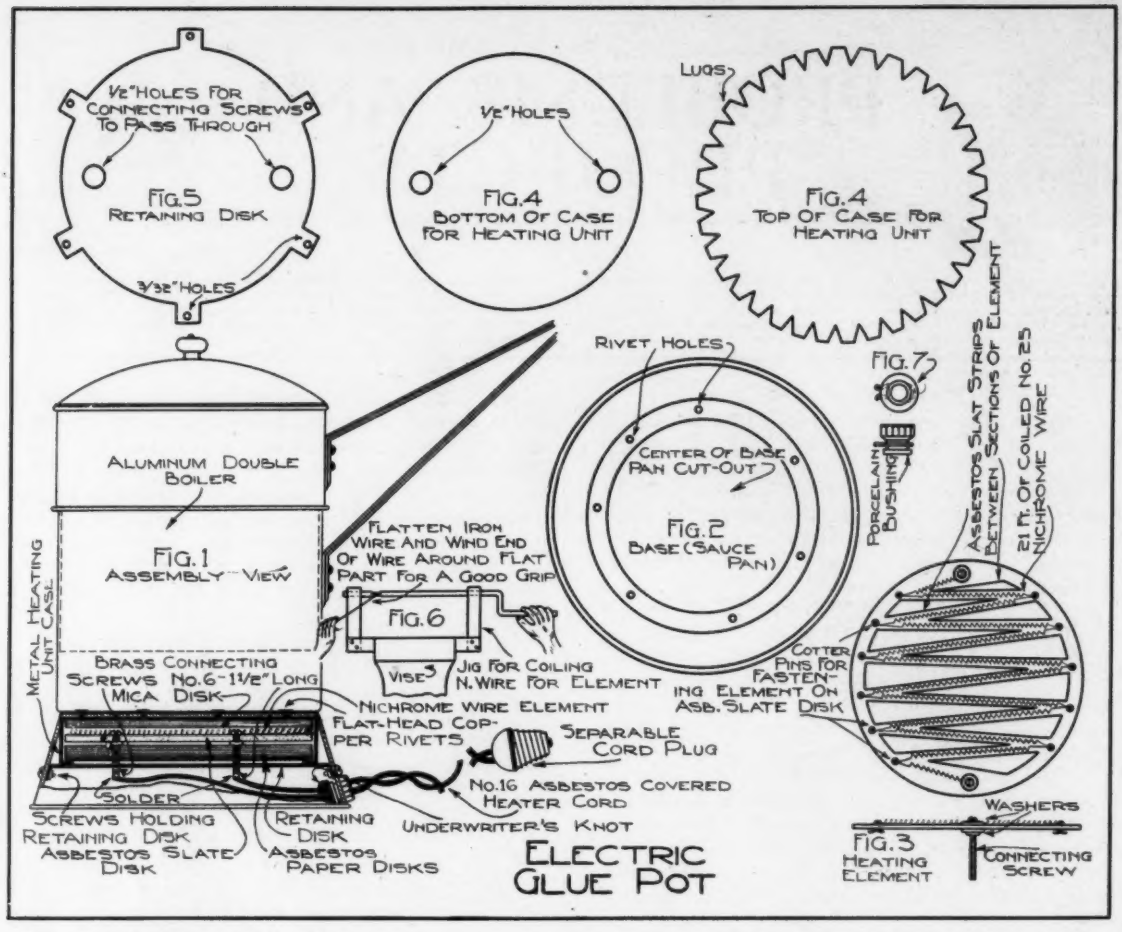
An electric glue pot or double boiler for shop use can be easily made from ordinary aluminum kitchen ware. A double boiler and a sauce pan, the diameter of which at the bottom



is the same as the bottom of the double boiler, are used. The other materials required are: Asbestos slate, sheet mica, heater cord, nichrome resistance wire for the heating element, and machine screws, all of which are readily obtainable. The list of materials, which follows, gives all the materials and parts required.

List of Materials

1 Aluminum double boiler
1 Aluminum sauce pan (diameter of bottom same as bottom of boiler)
1 Separable cord plug
6 Ft. No. 16 asbestos covered heater cord
1 Asbestos slate disk, ⅛ in. thick, and of a diameter ¼ in. less than inside bottom of the sauce pan used for the base



1 Porcelain bushing with ¼ in. hole
1 pc. sheet mica 1/16 by 5 by 15 in.
1 pc. asbestos paper 1/16 by 5 by 15 in.
6 Flat-head copper rivets with washers, ⅛ by ¼ in.
4 Machine screws and nuts, No. 4, ¼ in. long
2 Brass machine screws and nuts, No. 6, 1½ in. long
8 Brass washers to fit over No. 6 screws
21 Ft. No. 25 nichrome resistance wire

Construction

Mark out a circle on the bottom of the sauce pan (which serves as the base and also houses the heating element) so that about a ½-in. margin is left all around the sides. With a small chisel cut out the marked-out disk on the bottom of the pan (see Fig. 2). This disk is cut out in order that the heat may be conducted more readily to the double-boiler bottom from the heating element. Drill ⅛-in. holes in the margin of the bottom, spacing them equally and about 2 in. apart, for riveting to the bottom of the double-boiler bottom. Now place the base in position as shown in Figure 1 and mark out the position of the holes on the bottom of the double boiler, and drill ⅛-in. holes for the rivets. Rivet the base to the double boiler with f.h. copper rivets, using a washer on the riveted end. The rivets should be pushed through from the double boiler and the riveting done by holding the head of the rivet against the end of a bar of iron held in a vise. These rivets must be water-tight.

The construction of the heating element is shown in Figure 3. The complete assembly of the element with mica and asbestos-paper insulation and sheet-metal cover is shown in the assembly view in Figure 1.

Cut a disk of asbestos slate about ¼ in. less in diameter than the inside diameter of the pan used for the base. Also cut three disks of 1/16-in. sheet mica and three of asbestos paper of the same diameter as the slate disk. Punch two ¼-in. holes in the asbestos paper diametrically opposite and ½ in. from the edge. These disks are for insulating the bottom of the element and the connecting screws will pass through these holes. Also drill two 5/32-in. holes in the asbestos slate diametrically opposite and 9/16 in. from the edge. These are for the binding or connecting screws to the element. These holes should coincide with the holes in the asbestos paper. A container case for the element is made of No. 26 sheet metal. The pattern for the top and bottom are shown in Figure 4. The diameter is the same as that of the disks. The lugs of the top are bent down and over the bottom after the element is assembled (see Fig. 1). The heating element consists of 21 ft. of coiled No. 25 nichrome resistance wire. To coil the wire, wind it closely and tightly about a No. 10 iron wire (see Fig. 6). A winding jig may be made for this purpose as shown. When coiled, remove the wire and stretch it uniformly to separate the turns by about 1/16 in. so as to make it fit on the asbestos-slate disk, as shown in Figure 3. This will have to be done by the cut-and-try method, as the size of the pans used will vary. The wire should not come closer than about ½ in. to the edges of the disk to prevent shorting or grounding on the case. Drill 5/32-in. holes at the points where the turns of the element are to be fastened to the disk with wire staples or cotter pins. Figure 3 shows the method of fastening. Mount the nichrome wire on the asbestos-slate disk and connect the ends securely under the ⅛ by 1½-in. binding screws, using a brass washer on each side of the wire to insure a good electrical contact. See that the wire staples are rigid and that the ends on the bottom side do not touch, causing part of the element to short. Cut strips

of asbestos slate to fit between the sections of the coiled nichrome wire in the element to prevent sections from coming in contact with each other. Now we are ready to assemble the complete heating unit. Bend all the lugs of the case cover at right angles, and place in the three disks of mica. Place the strips of asbestos slate between the sections of the element and place the element in the cover next to the mica, pressing against it so that the strips are not misplaced while the cover is turned over on the bench with the lugs up. Next slip the asbestos-paper disks and the bottom of the metal case over the binding or connecting screws so that one binding screw passes through each hole. Now bend down all the lugs of the cover over the metal bottom and pound lightly with a hammer so that the parts are clamped rigidly and held in place to prevent moving or turning around.

The whole heating unit should fit snugly into the bottom of the base pan. It is held in place tightly against the double-boiler bottom by means of the retaining disk shown in Figure 5. Cut this disk out of about No. 26 sheet metal and of a diameter to fit the inside of the base on top of the heating unit when that is in place next to the double-boiler bottom. This diameter will have to be determined by trial, and care should be taken that it is not left too large, because it will then be impossible to press the heating unit tightly against the boiler bottom, resulting in an air gap and greatly reducing the efficiency of the heating element. Leave lugs as shown in drawing, and drill 3/32-in. holes in them for fastening to the sides of the base. Also punch ½-in. holes for the connecting screws from the element to pass through without touching the sides. Place heating unit in position and fasten retaining disk in place with No. 4 machine screws. Drill or punch a hole through the base in the side directly under the handle of the bottom of the double boiler for the porcelain bushing through which the connecting cord passes. This hole will have to be made to fit the particular bushing used. A bushing with a ¼-in. hole is large enough. Such a bushing with a spring clip to hold it in place may be obtained from an electric shop (see Fig. 7). Attach a separable cord plug to one end of the No. 16 heater cord and pass the other end through the bushing and solder one cord to each of the connecting screws from the element and the device is completed. The writer has found this electric glue pot to work very satisfactorily for heating glue, melting paraffin, etc. It will even do as a corn popper. The total cost of the complete device is about one dollar.

LATHE MANDREL

Practice and Principles Involved in Operating an Engine Lathe

G. H. Snaddon, Head, Manual-Arts Department, Central High School, Detroit, Michigan

Processes Involved

Cylindrical turning between centers.

Problem

To prepare a standard lathe mandrel for heat treating and grinding.

Other Problems Suggested

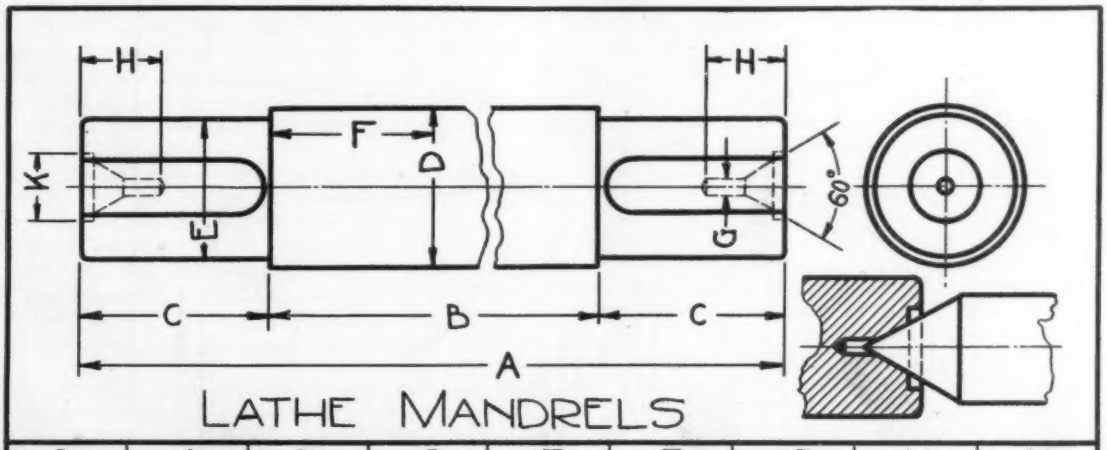
Bolts; cap screw; stud; boring bar; blank for practice threading or any other machine part or tool involving straight turning between centers.

Specifications

Material: Use cold-rolled or tool steel approximately ¼ in. oversize. Make size assigned to you.

Procedure or Operations

1. Saw stock ¼ in. longer than finished length given in the blue print.
2. Chuck stock in three-jaw universal lathe chuck.
3. Face end and center; reverse, face to required length, and center. Feed center drill carefully and use oil on it. Use high speed in centering. Both centers should measure ¼ in. across the end.
4. Remove chuck and screw on the faceplate.
5. True live center; check tailstock or dead center for alignment. Set tool bit on center line or slightly above. Set the tool to the left of the compound. Take a short hold on the tool bit and the tool holder.
6. Mount stock between centers, neither too tight nor too loose; lubricate the dead center frequently with white lead and oil.
7. Rough-turn to within 1/16 in. of the required size. Turn to within ¼ in. from the dog, then reverse and turn the other end. Measure the diameter with outside calipers. Use medium speed in rough-turning.



LATHE MANDRELS

D	A	B	C	E	F	G	H	K
1/2"	5"	3 1/8"	15/16"	.437	1"	.063	1/4"	1/4"
5/8"	5 1/2"	3 1/2"	1"	.546	1"	.0712	5/16"	19/64"
3/4"	6"	3 7/8"	1 1/16"	.656	1 1/8"	.079	3/8"	11/32"
7/8"	6 1/2"	4 1/4"	1 1/8"	.7656	1 1/8"	.088	7/16"	25/64"
1"	7"	4 5/8"	1 3/16"	.875	1 3/16"	.096	1/2"	3/8"

8. Turn the ends to the finished diameter.

9. Finish-turn the center part. Allow .015 in. for grinding; use micrometer measurements. (Consult instruction sheet on how to read a micrometer.) Use high speed and slow feed on finish-turning. Have your tool bit sharp.

10. File all over so as to remove the tool marks; file the ends slightly round. Use a smooth file. Use high speed in filing. (Have your instructor show you how to use the file.)

11. File or mill flats on each end of the mandrel as shown in the blue print.

12. For procedure in heat treating follow instruction sheet on heat treatment of metals.

Appraisal

Evaluate or appraise the finished problem. Is it the result of your best efforts? Show it to your instructor for examination and get his approval of it.

Note

Work carefully around machinery at all times.

Apply your thought, time, and energy to the problem at hand each day.

Keep the machine well oiled.

Do not get the stock too tight between the lathe centers.

Keep the dead center well lubricated.

Clean the machine thoroughly and check in your tools every day at the end of the class period.

Tools Used

Combination center drill; drill chuck; lathe dog; tool bit; outside calipers; ruler; micrometer.

Application

A mandrel is a tool used in manufacturing to press, force, or thread into machine parts and the like, so that they can be further machined on centers. The chief types of arbors in common use are: (1) Solid, (2) Expanding, (3) Gang, (4) Special. The mandrel is pressed into the work by means of a mandrel or arbor press.

References

Advanced Machine Work, Smith, Section 1, pages 1 to 167; Section 2, pages 2 to 210.

Machine Tool Operation, Burghardt, Part I, pages 1 to 124 inclusive.

Questions

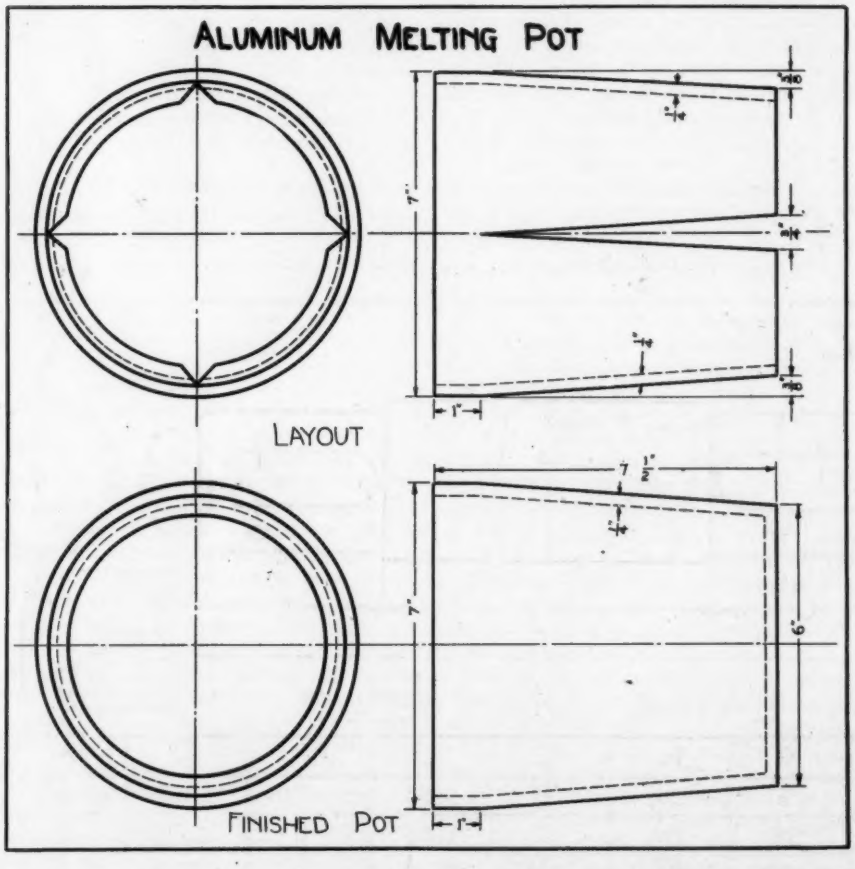
Check your understanding of the principles involved in this problem by handing in to your instructor a well-written copy of the answers to the following questions:

1. Why should both centers be made the same depth?
2. What is meant by "running true"?; by "truing a live center"?
3. Show why the best results are obtained by setting the tool bit on the center line; or slightly above, rather than below the center; or too far above.
4. Why is it best to take a short hold on the tool bit and tool holder?
5. Why is the alignment of centers important in straight turning?
6. Should you hear a squeak around your machine, how would you proceed to remedy it?

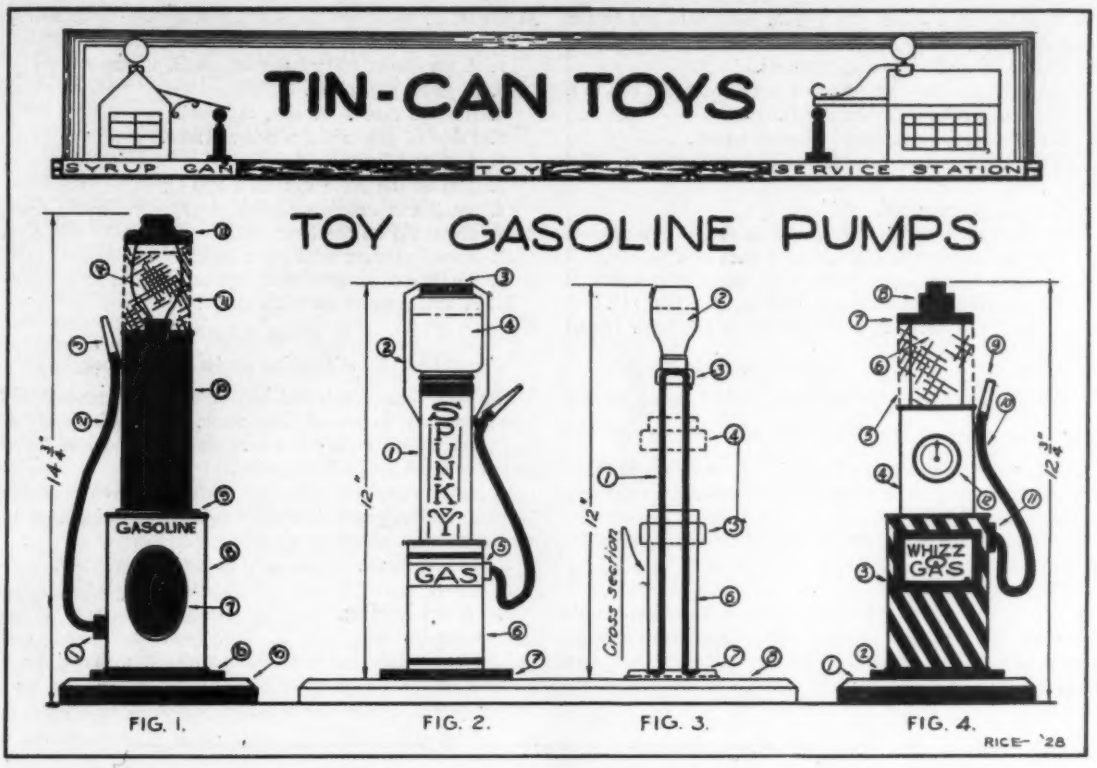
A PROJECT FOR THE WELDING SHOP

H. A. Allender, High School, Bristow, Oklahoma

The melting pot shown herewith, involves the use of both the welding torch and the cutting torch. It will be found very useful when aluminum is to be melted.



To make one, cut a piece of 7-in. pipe, 7½ in. long. A piece of flat belting wrapped tightly around the pipe at the point where it is to be cut, may be used to get an even mark around the circumference of the pipe. The mark may be made with chalk.



After the pipe has been cut, draw four longitudinal lines, equally spaced, along its outside. At the end which is to be the bottom, measure ⅜ in. on each side of each of these lines. From the end which is to be the top, measure 1 in. down on each line. Now connect the two points on the lower end of each line with the point which is 1 in. down from the top. This will form a long V and is the amount of material to be removed from the cylinder to produce the taper.

Place the pipe in a horizontal position and cut out the V's, using the cutting torch.

After this has been done, take it to an anvil and with even blows on the four parts, drive them down until they come in contact with each other along their full lengths.

Weld the seams, using steel welding rods and about a No. 8 tip. In case electric-welding equipment is available the seams may be welded electrically.

To make the bottom, cut out a round plate of sheet steel about 5/16 in. thick. It should be just large enough to slip down into the pot from the top to a snug fit. This cutting also should be done with the cutting torch.

With the pot upright, tack the bottom in three places on the inside. Invert it and weld up the seam all around, using either the electric or the acetylene welding method.

The drawing shows the layout of the cylinder, also the finished pot.

The dimensions given will make the pot 1 in. less in diameter at the bottom than it is at the top.

The pot, if made of steel, will cut readily under the cutting torch and will have a higher melting point than aluminum.

TIN-CAN TOY GASOLINE PUMPS

Charles Rice, North Junior High School, Everett, Washington

After studying the illustration of the toy gasoline pumps made from tin cans, the reader will at once see the possibilities of more and varied designs. Only a few have been presented in order to illustrate the idea.

Encouraging the Creative Instinct

The instructor may encourage the creative instinct in the student by suggesting that a toy gasoline pump be designed from tin cans. By using tin cans of various sizes in the junior-high-school metal shop, one may teach design and proportion in a simple way, show how to practice economy in the utilization of materials, encourage the creative instinct, and yet interest the boy. The gasoline pump described in this article, is a toy with which the younger children will enjoy playing.

Importance of the Finishing Touches

The painting and decoration of tin-can toys is the last step, but it is by no means the least important step. The finishing touches are needed to create the proper illusion, i.e., to give the impression that it is the "real thing." After the toy has been assembled, the exterior should be well cleaned to remove grease or other substances. Colored enamels or brushing lacquer are useful for the all-over coat. Use a spray gun to get the best results. After the finish is dry, the toy is ready to be decorated. The decoration however, should be limited to the ability of each student.

Waterproof Ink for Striping

Waterproof colored inks may be used for lettering and striping. Wipe the painted surface with a cloth filled with powdered chalk before using the ink. A ruling pen, such as used in mechanical drawing, may be used for outlining or striping, while a small brush or spoon-bill pen will be useful for filling in and lettering. In order to assure a more lasting job, the surface should be protected with a coat of white shellac or clear lacquer applied with a brush or spray gun.

List of Parts

Figure 1. (The parts to be soldered together.)

1. Small can cover, into which a hole has been made to admit end of wire (2).
2. Short piece of round electric-light cord, soldered at (1) and (3).
3. Hose tip may be made by rolling up a small piece of tin.
4. Small pill bottle, inverted, and cover soldered to (10). To be partly filled with water.
5. Wooden base.
6. Tin cover from a cookie box or can, filled with wood and tacked to the wooden base.

7. Oval top of a cocoa can (½-lb. size) soldered to the surface of part (8).
8. Cocoa can, ½-lb. size (inverted).
9. Another oval top from a cocoa can (inverted). See (7).
10. Talcum-powder can (inverted).
11. Small piece of galvanized window screen.
12. Top of the talcum-powder can that was used at (10).

Figure 2.

1. A small paprika can.
2. Narrow piece of tin to keep (3) in place. Two needed.
3. Top of the paprika can used for part (1).
4. Vaseline bottle partly filled with water. The bottle is inverted, with the top soldered to the paprika can (1).
5. A small can cover to hold the end of the hose. (Same as (1) in Figure 1.)
6. Spice can, 2-oz. size.
7. A tin cover, filled with wood and tacked to the wooden base.

Figure 3.

1. A piece of heavy galvanized wire, formed to the shape illustrated, with the ends flattened and soldered to the can cover at (3).
2. A small pill bottle, partly filled with water, with the top soldered to a small can cover (3).
3. A small can cover.
4. and 5. Cover of the paprika can (6) soldered to a larger cover. Two holes are made through the covers to allow the wire (1) to pass through. The cap that has been thus formed by the two covers may be raised and lowered on the wire parts.
6. Paprika can.
7. An oval cover from a cocoa can, tacked to a wooden base.
8. The wooden base.

Figure 4.

1. A wooden base.
2. A tin cover, rectangular or round in shape.
3. A ½-lb. cocoa can.
4. A spice can, 2-oz. size, inverted.
5. Piece of galvanized window screen.
6. A glass bottle.
7. Top of the spice can used at (4).
8. Small can covers soldered to (7).
9. Metal tip on the hose (10).
10. Round electric cord for a hose.
11. Small can cover to hold end of hose.
12. A dial painted on the surface.

DESK LAMP

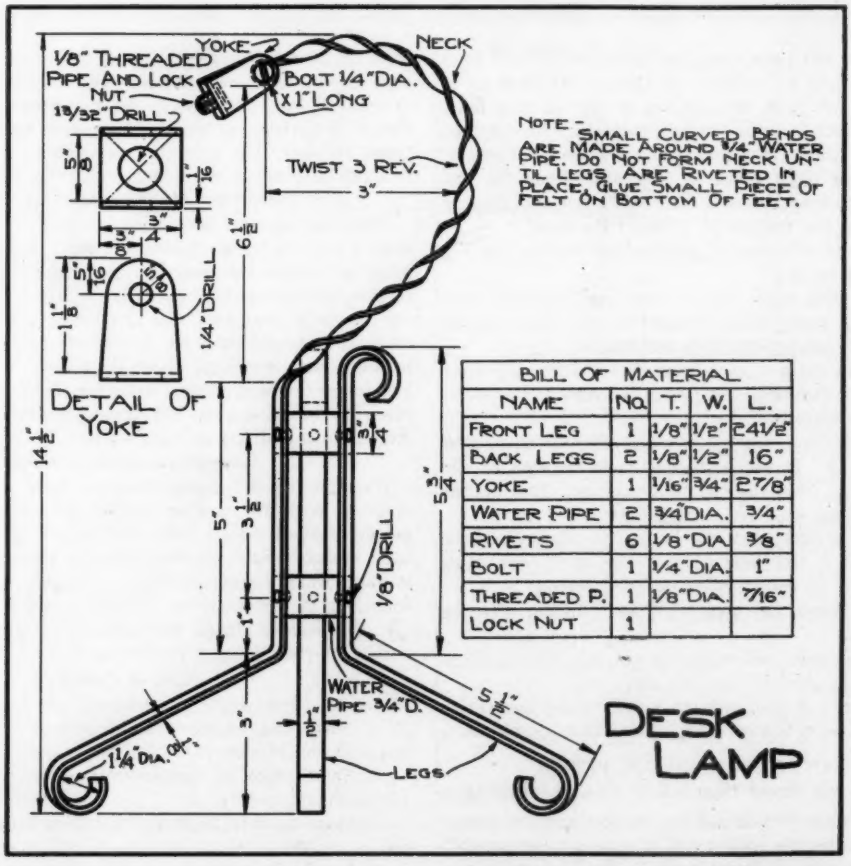
Gerald L. Waltrip, Louisville, Kentucky

The desk lamp illustrated herewith involves several of the operations used in wrought-iron work. Its simplicity of design and practical use makes it a very desirable problem for boys in the seventh and eighth grades.

In constructing this lamp the student is given opportunity to gain a knowledge of the following instructional units in wrought-iron work:

1. Cutting metal.
2. Filing.
3. Curved bending.
4. Angle bending.
5. Locating centers.
6. Drilling.
7. Riveting.
8. Twisting.

In making this lamp, all like operations should be performed before starting another. By doing this the student will be able to work with a higher degree of accuracy.


YOKE
NECK
1/8" THREADED PIPE AND LOCK NUT
13/32" DRILL
BOLT 1/4" DIA. X 1" LONG
TWIST 3 REV.
3"
NOTE - SMALL CURVED BENDS ARE MADE AROUND 3/4" WATER PIPE. DO NOT FORM NECK UNTIL LEGS ARE RIVETED IN PLACE. GLUE SMALL PIECE OF FELT ON BOTTOM OF FEET.
1/4" DRILL
DETAIL OF YOKE
1/8" DRILL
WATER PIPE 3/4" O.
LEGS
DESK LAMP
BILL OF MATERIAL
NAME | NO. | T. | W. | L.
FRONT LEG | 1 | 1/8" | 1/2" | 24 1/2"
BACK LEGS | 2 | 1/8" | 1/2" | 16"
YOKE | 1 | 1/16" | 3/4" | 2 7/8"
WATER PIPE | 2 | 3/4" DIA. | | 3/4"
RIVETS | 6 | 1/8" DIA. | | 3/8"
BOLT | 1 | 1/4" DIA. | | 1"
THREADED P. | 1 | 1/8" DIA. | | 7/16"
LOCK NUT | 1 | | |

The writer teaches his students to do the job in the following order:

1. Cut and square the ends of the metal for the legs.
2. Bend 1¼-in. diameter circles on one end of all legs.

3. Bend 1¼-in. diameter circle in the opposite direction, on the other end of the two back legs.

4. On opposite end of front leg bend a ⅜-in. diameter circle. This can be done by bending the metal around a ⅜-in. diameter rod.

5. From the lower end of all the feet measure off 5½ in. and make an angle bend as shown on the plan.

6. On the front leg measure off 5 in. from this bend, and give the remaining metal a twist of 3 revolutions.

7. Place legs side by side, face up, and square lines across for the location of centers for rivet holes.

8. Locate centers for rivets on water-pipe spacers.

9. Center punch and drill all holes.

10. Rivet legs in place.

11. Form neck of lamp as shown in plan.

12. Glue small piece of felt on bottom of feet.

13. Attach light socket.

14. Apply the finish.

This lamp may be finished in any color scheme desired. A small hand spray works very successfully in applying a two-tone lacquer finish.

INSPECTING AND STRAIGHTENING THE FORD MODEL T CRANKCASE

Ray F. Kuns, Cincinnati, Ohio

Many repairmen lose sight of the fact that in all Ford Model T engines the construction of the engine and transmission unit is such that when the crankshaft flange and the transmission-shaft flange are joined rigidly together, they appear as one shaft, giving what amounts to a four-bearing mounting (see Figure 1). In order to have these four bearings in alignment, it is necessary that the crankcase be put

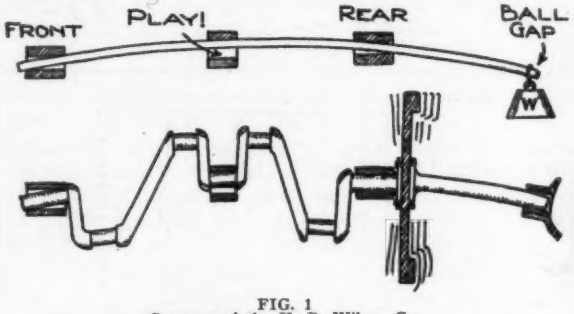


FIG. 1
Courtesy of the K. R. Wilson Co.

in condition very carefully. Best practice indicates the use of a jig or flat-surface fixture for straightening and aligning the crankcase.

Procedure

1. Clean the crankcase thoroughly, making certain that no grit or dirt is left in it and that all particles of old gasket materials are scraped from the edges.

2. Use a hammer to drive back the edges surrounding all cap-screw holes, which have been raised in previous assembling operations.

3. Place the crankcase on the aligning jig and check up to see that the ends of the case and the arms correspond to the fittings of the aligning jig.

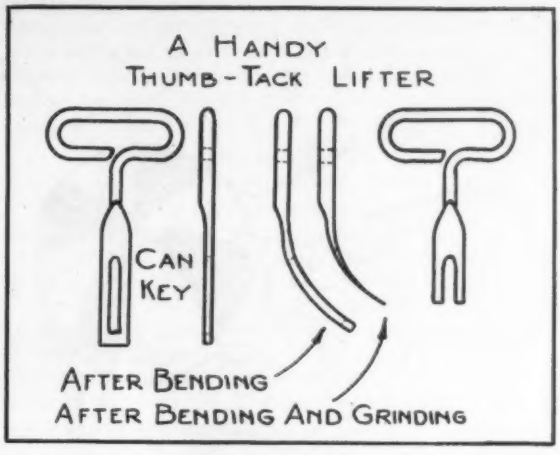
4. If not sprung too badly, a hammer may be used to shape up the case while it is held on the jig.

5. If the case is badly sprung, cracked, or otherwise damaged, it is best to replace it with a new one. Minor breaks or cracks may be welded or brazed.

A HANDY THUMB-TACK LIFTER

Donald V. Zoerb, High School, Clayton, Missouri

The handy thumb-tack lifter illustrated herewith makes an inexpensive but valuable addition to the drafting equipment of a high-school student. I have been using them in my class for several years, and find that they are not only very handy,



but that they are very valuable, because once a boy is supplied with one there is no need for his using the edge of his triangle or his ruling pen for lifting thumb tacks.

This inexpensive, handy, and serviceable thumb-tack lifter can be quickly and easily made from the opener of a coffee or sardine can in two operations. First, bend one end to the desired curve by clasping it in the vise, then file or grind to the shape indicated in the drawing, and the job is done.

PERFORMING ELEPHANT

W. I. Tawes, Morgantown, West Virginia

The principle of this toy is simple. When constructed carefully it is very realistic. The elephant actually looks as if it were balancing itself upon a rolling ball. The trainer impatiently works his spear.

Figure 1 shows how the elephant looks before the hemispheres are attached. Notice that the elephant does not move. The rolling hemispheres on each side give the balancing effect.

Tools Necessary: Coping saw; soldering outfit; side-cutting pliers; hand drill with bits; small screw driver.

Materials Necessary: 1½ ft. of ⅜-in., 3-ply stock; ⅛-in. tinned wire, 24 in. long; scrap sheet metal for bearings; 1 doz. ⅛-in. tinned washers; 6 small r.h. screws.

Paint: Various colors.

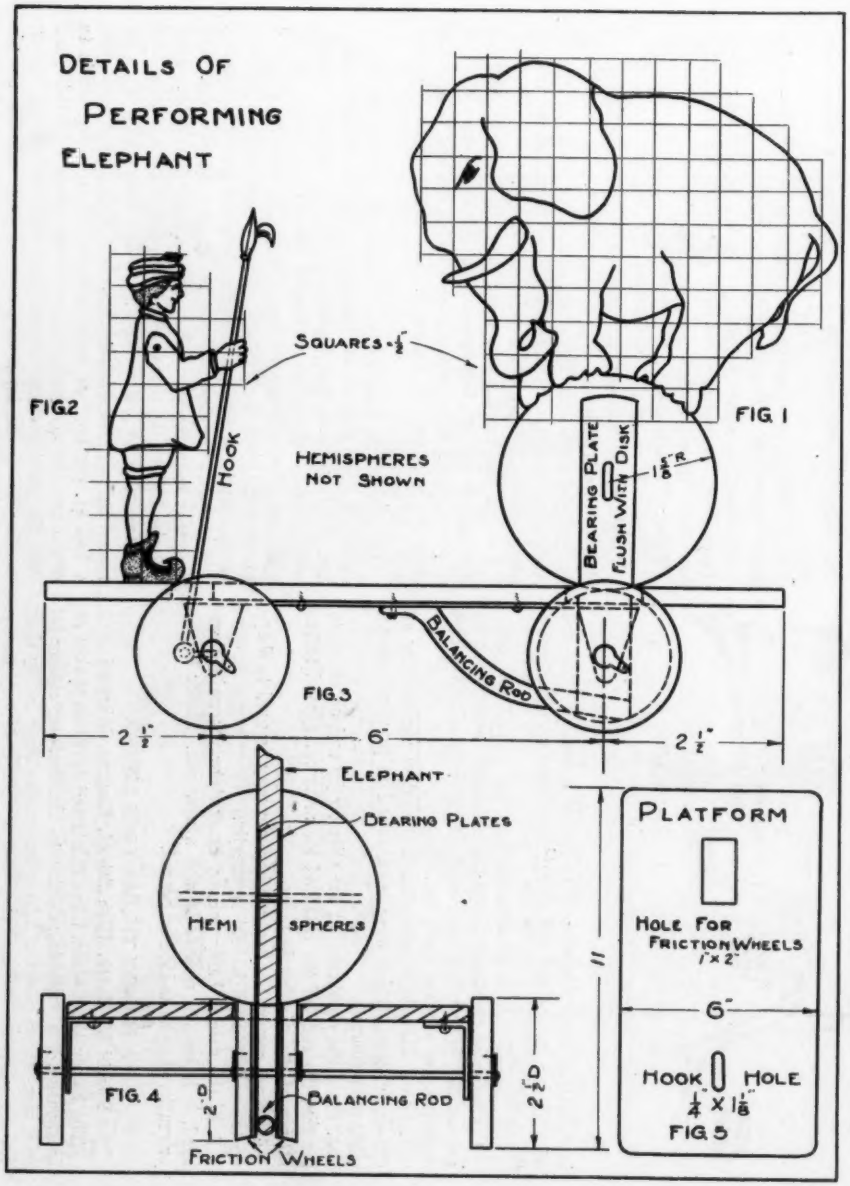
Operations

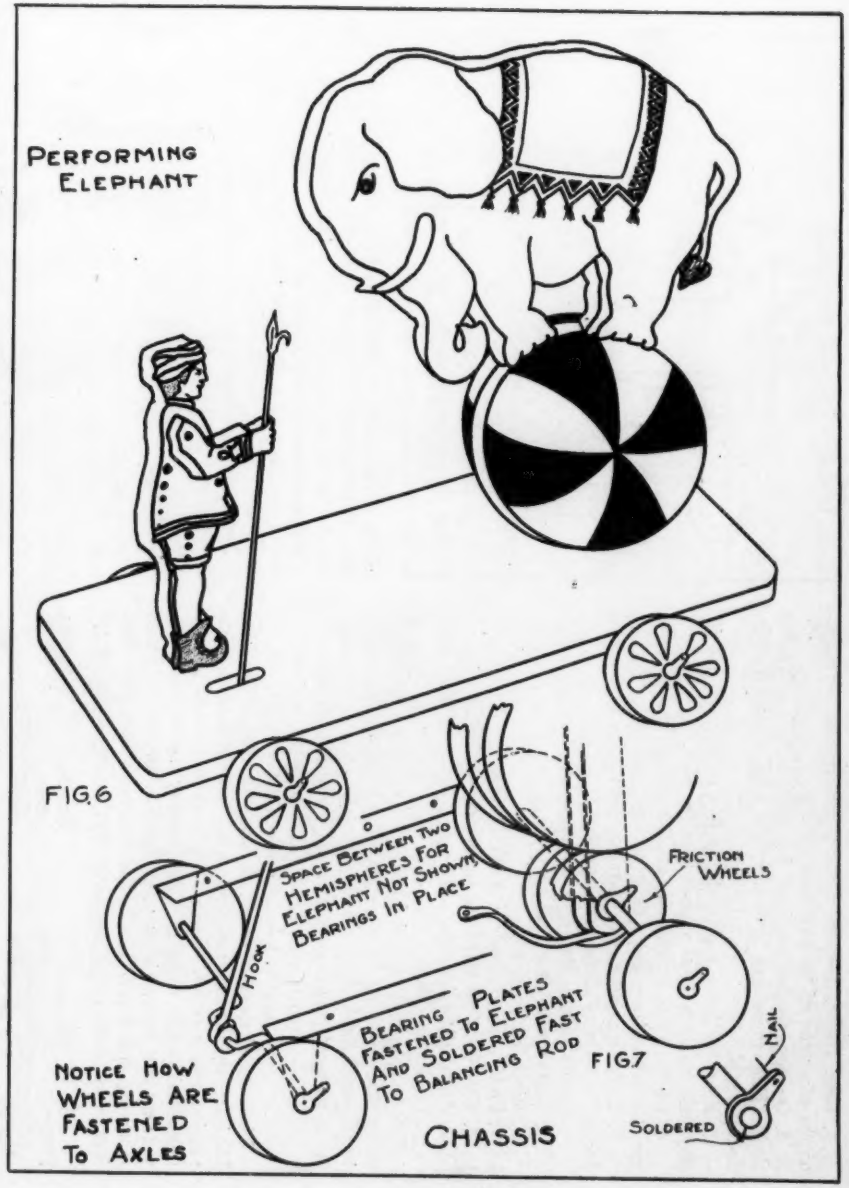
Elephant and Trainer. Lay out on ⅜-in., 3-ply stock the elephant and trainer as shown in Figure 1. The circle is a part of the elephant. The ears, tusk, eyes, etc., are carved slightly to emphasize the parts. These parts can be further treated while the project is being decorated.

Cut out the bearing plates and drill the axle hole, and the oblong hole for the hemisphere pin. Note the exact location of these holes. When made, fasten to the circular part of the elephant, as shown in Figure 1. The plates are to be flush with the wood.

The trainer is fastened to the platform with the boots extending down through the platform. Glue is used for fastening. The arms are made separately and fastened to the body with a copper pin which is headed by soldering a washer at each end. The arms should hang freely. The spear is fastened to the hand with a very small pin. The spear may be flattened slightly at this point so the hole can be drilled easier.

The Ball. The ball is made up of two hemispheres. The best way to make the ball is turn it out on a lathe. Turn out the ball to the proper size, and part with a parting tool the thickness of the material, i.e., the disk which is to be placed between the hemispheres. If a lathe is not accessible, a ball of any kind of wood will do. If it is impossible to find a ball already made, cut two disks about 1 in. thick and rasp the outside edges round. This latter method is almost as effective as the first. Drill a small pilot hole for the pin


DETAILS OF
PERFORMING
ELEPHANT
FIG.2
SQUARES - 1/2"
HOOK
HEMISPHERES
NOT SHOWN
FIG. 1
BEARING PLATE
FLUSH WITH DISK
1 3/8" R
BALANCING ROD
FIG.3
2 1/2"
6"
2 1/2"
ELEPHANT
BEARING PLATES
HEMI
SPHERES
11
FIG. 4
D/2
BALANCING ROD
2 1/2 D
FRICTION WHEELS
PLATFORM
HOLE FOR
FRICTION WHEELS
1" X 2"
6"
HOOK
HOLE
1/4 X 1 1/8"
FIG. 5


PERFORMING
ELEPHANT
FIG.6
SPACE BETWEEN TWO
HEMISPHERES FOR
ELEPHANT NOT SHOWN
BEARINGS IN PLACE
FRICTION
WHEELS
HOOK
BEARING PLATES
FASTENED TO ELEPHANT
AND SOLDERED FAST
TO BALANCING ROD
FIG.7
NOTICE HOW
WHEELS ARE
FASTENED
TO AXLES
CHASSIS
NAIL
SOLDERED

to follow, which is used to hold the hemispheres together. Notice that the hemispheres, when fastened together in place, will be free to move up and down a little, because of the oblong hole through which the pin passes. The reason for this is obvious. The ball will at all times be resting upon the friction wheels. The pin that holds the ball together may be passed entirely through and a washer soldered on each end.

Rear Wheels and Axle. Figure 4 shows very plainly this operation. Caution: Do not set the friction wheels too close to the bearing plate. Allow at least 1/16 in. for play. The friction wheels are fastened to the axle (1/8-in. wire) the same way as the main wheels. The holes in the wheels are drilled small and the axle forced into them. A small piece of sheet copper is cut to the shape shown in the drawing and soldered to the axle. A wire brad is next driven through the small end of the copper into the wheel. This method of fastening the wheels to the axle is very simple. The copper may be fastened to the wheels before the axles are forced in place.

Front Wheels and Axle. Figure 7 shows the way the front axle is bent. Two washers are soldered on the camshaft, one on each side of the spear hook. The wheels are fastened the same as the back wheels. In each case a washer is placed between the wheel and the bearings.

Bearings. It will be noticed that the bearings for the wheels are in pairs running the length of the chassis. By bearings, in this case, is meant the metal strip as well as the holes. Heavy sheet metal, about 18 gauge, should be used for bearings.

Platform. For dimensions, see Figure 5.

Assembly. First run the axles through the bearing holes. Then fasten the bearings in place. Remember the bearing plate fastened to the elephant; the axle must go through this also, as is shown in Figure 4. The balancing rod may now be adjusted and fastened in place. It is best to have the hook properly fastened to the front axle before assembling. Fasten the ball in place and the hook to the trainer's hand.

NOTE. The balancing rod should fit between the bearing plates and be soldered fast, as shown in Figure 4.

Finish. This is very important. A good finish is the life of the toy. Paint in appropriate colors. Paint the toy thoroughly, for if this is not done, dampness will tend to tear the veneer layers apart. The toy may be given a coat of waterproof varnish after the paint has thoroughly dried.

AN EXCELLENT HAMMER PAD

Frank W. Bentley, Jr., Missouri Valley, Iowa

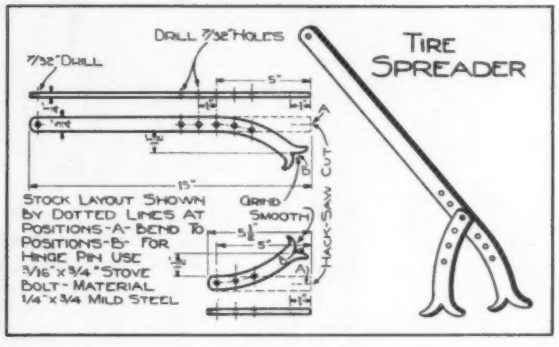
Nails of various sizes must frequently be pulled out of finished surfaces which must not be defaced by the head and face of the hammer as the nail is pulled out. Many things may be used as a pad for the hammer head, but the one shown herewith is a little better than most of those commonly used. To make such a pad, take one of the soft-rubber caster cups, which may be purchased for about a nickel, and cut out about an inch of the recess. Taper this side down to a thin edge, and cut a V into it so it may be placed as closely to the nail head as possible. When drawing a nail, rest the hammer head in the cuplike top and pull on the handle as hard as you wish. The soft rubber pad will not slip, nor will it mar the surface in any way.

THE HAMMER PAD

TIRE SPREADER

Lemuel Harris, Nogales, Arizona

The tire spreader illustrated herewith is a project for the general shop, and is a useful article that almost any boy would like to make. It is simple in construction, easy to use, and is a very efficient tool. A large tire may be spread with ease, using only one hand to manipulate the tool, thus leaving the other hand free to search for tacks or fabric breaks inside the tire. The tool may be locked in a full-spread position by inserting a nail or pin through the extra holes that may be in line in both bars. The tool may be adjusted to fit any size of tire by changing the hinge pin.


DRILL 7/32" HOLES
7/32" DRILL
TIRE SPREADER
5"
15"
STOCK LAYOUT SHOWN BY DOTTED LINES AT POSITIONS-A- BEND TO POSITIONS-B- FOR HINGE PIN USE 3/16" x 3/4" STOVE BOLT - MATERIAL 1/4" x 3/4 MILD STEEL
GRIND SMOOTH
HACK-SAW CUT

The tool is made of 1/4 by 3/4-in. mild steel. The material is first cut to length. One end of each bar is then split back 1 in. from the end and shaped according to the illustration. This is accomplished by heating the steel and forcing a cold chisel between the points to spread them. The final shaping of the curved points is done with a hammer over the horn of an anvil. The bars should be shaped alike and the holes should be drilled to match in both bars. The points may be ground smooth to prevent cutting the tire.

A hole is drilled in the handle so that the tire spreader may be hung on a nail or hook when not in use.

FIREPLACE SET

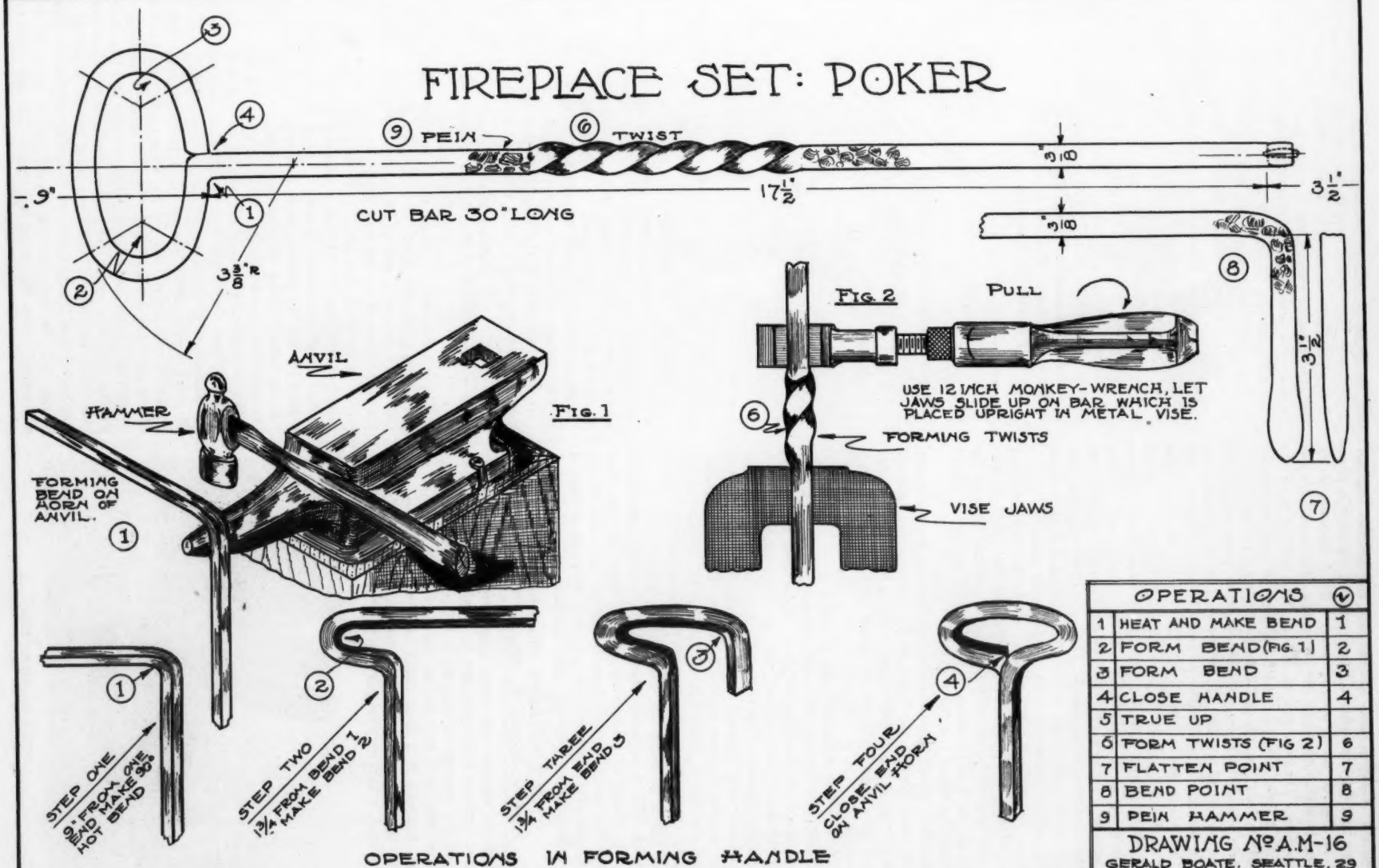
Gerald A. Boate, Seattle, Washington

The Poker

The fireplace set, of which the poker illustrated herewith is the first piece, was made by a junior-high-school boy at a cost which did not exceed $1.50 for the material out of which the four pieces of the set were made.

The poker is the key project of the set, as the experience gained in making it embraces operations which are fundamental in all ornamental ironwork. If a boy is able to do a good job on this project, he may be expected to produce a lamp or fernery which will also be satisfactory. The sequence of operations shown at the lower right of the illustration which accompanies this article should be followed closely. Figure 1, and the illustrations at the foot of the drawing, are illustrated in detail so that there will be no possibility of going wrong. After sawing off a piece of 3/8-in. square mild steel with a hack saw, get the forge ready and heat 9 in. of one end of it red-hot. After the right-angle bend has been made, cool off the piece by dipping the angle end into water. Reheat the piece again and put on the bend shown in step two. Cool off, reheat, and form bend No. 3, described in step three. The fourth operation is closing the handle shown in step four. See that the joint is close and all curves uniform and central about the remaining length. Do any correcting

FIREPLACE SET: POKER



OPERATIONS IN FORMING HANDLE

OPERATIONS		⑨
1	HEAT AND MAKE BEND	1
2	FORM BEND (FIG. 1)	2
3	FORM BEND	3
4	CLOSE HANDLE	4
5	TRUE UP	
6	FORM TWISTS (FIG 2)	6
7	FLATTEN POINT	7
8	BEND POINT	8
9	PEIN HAMMER	9

DRAWING NO. A.M-16
GERALD BOATE. SEATTLE, 29

necessary on the horn and face of anvil; this is operation No. 5 and is spoken of as *truing up*. If these steps have been followed and the work done with thoughtful care, a good handle should be produced. This handle idea is a "motif" (the leading feature) and care must be taken to see that all handles made, not only for the poker but also for the shovel, tongs, and holder, are well formed and look alike.

The *sixth operation* is forming the twists in the handle. Have the steel red-hot, and the vise jaws clamping the bar close to the beginning of the twist. Slide the work downward in a vertical position until it is placed just where you want it, then have someone else tighten the vise jaws, *tight*. As you twist, slide the jaws of the wrench upward as the twists are formed. Pull the wrench handle right around in a circle, with an even pull, and keep sliding it upward as the twists are formed.

The Seventh Operation: Flattening the point. Remember this: When a good forging heat is made at the extreme end from the handle, that the point may be made while holding the handle in the left hand resting the heated end on the face of the anvil and while rotating the left hand so that it will turn completely over, hammer, or "dress up" the point until it closely resembles the form which is desired. This is shown at reference mark 7 (figure 7 within the circle, in the drawing). Be sure that the formed handle is cold before attempting to heat the point. Dip the handle in a water trough or pail before holding it in the bare hand. If by carelessness the hand or fingers get burned, apply picric acid solution with a piece of absorbent cotton immediately. Do not wrap or bandage the burn. This solution for burns will immediately give relief.

Operation Eight: Lay the cold poker down on the floor. It should lie flat, if it does not, straighten it. Measure back 3½ in. from the extreme end, and after heating at the point where the bend is to be made, place it over the face of the anvil and bend the point downward, using a 1½-lb. hammer. With the poker again flat on the floor, check the point with a steel square to be sure that it is vertical in every direction, and any corrections which appear necessary should now be made.

Operation Nine: Peen hammering gives an additional touch of ornamentation (marked 9) to wrought-iron work which otherwise would seem very plain and ordinary. Peen hammering is done with the ball or peen end of a 1½-lb. ball-peen, or machinist's hammer. Only flat surfaces are to be so treated. The work to be peened should be held flat on the face of the anvil, and quick, snappy, well-directed blows placed over each of the four flat surfaces with the hammer. The final finish of the poker should be that selected for the entire set, so after the poker has been finished, it may be put aside until the entire fireplace set has been made.

A SOLDERLESS, RIVETLESS DUSTPAN

Thomas Gotschall, Colgan, North Dakota

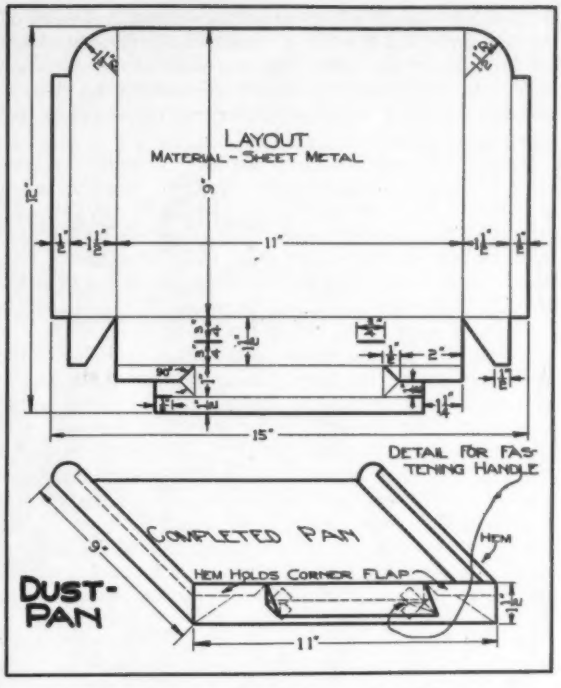
The simple dustpan illustrated herewith may be made at home or in the shop with the most common tools. No rivets or solder are used. The only material that is required is a piece of sheet-metal 12 by 15 in. The necessary tools are: rule, hammer or mallet, pliers, tin snips, and cold chisel. Any piece of wood or metal which has a square edge may be used as a block on which to shape the tin.

The layout drawing gives the pattern to be drawn on the sheet of metal. It is to be cut along all solid lines, the light lines indicating folds. The small slots appearing in the drawing of the back of the pan are for inserting the tabs which fasten in the handle, as indicated in the sketch of the finished pan.

Folding is to be done in the following order:

1. Fold sides, then back, to right angles with bottom along inner bending lines.

2. Hem the sides as shown, turning the hem in.



3. Bend the corner flaps, which are attached to the sides, flat against the back. Now bend down the short-hem pieces along the back, and the corner flaps will be held firmly in place.

4. Hem the piece which was left for a handle, bending the hem piece back.

5. Bend the handle square across the ends, as shown by the light bending lines. Then bend the tabs over at a 45-deg. angle. When the handle is bent back till the three-cornered piece at the ends strikes the back of the pan, the tabs should enter the slots in the back, and may be bent apart to hold the handle in place, as shown in the view of the completed pan.

The pan is now shaped, and all sharp edges are hemmed, except at the front. This part is not to be hemmed, but the pan will pick up the dirt better if this edge is bent down slightly to make it fit closer to the floor. The completed project makes an unusually satisfactory dustpan, being more substantial than those ordinarily sold.

A simpler variation eliminates the handle, a hem then running completely across the back.

A CANDELABRUM

J. W. Bollinger, Roosevelt Junior High School, Tulsa, Oklahoma

(See Supplement No. 201)

A candelabrum is a large candlestick with several branches. The one shown herewith is tall enough to stand on the floor. Such a candelabrum looks well in a large living room or in a large hallway.

Make a full-sized drawing on a piece of squared paper of the curve to which to shape the legs. Bend the iron over the anvil and compare with the drawing. The sharp bend can be made by placing the iron in the vise at that point and striking it with a hammer. Make sure that the four legs are as nearly alike as possible.

The center rod is made of ½-in. round iron, and is thinned down on the anvil to ⅜-in. diameter for 6 in. of its length near the top end. Two and a half inches at the extreme end are turned down on the lathe to ¼-in. diameter for the candle cup.

Rivet the legs to the center rod by means of 3/16-in. rivets. One procedure to locate the rivet holes is to place each of

the two legs against a large carpenter's square and mark off the position of the holes as indicated on the drawing. Mark off the holes on the center rod, and when all the holes are drilled, they should line up so that the center rod will stand straight. Proceed in a similar manner with the other legs, and fasten them in place.

Make a full-sized drawing of the curve to which the arms are to be shaped on squared paper. Turn 2½ in. of the end of each one to ¼-in. diameter to fit the candle cup. Measure 3 in. from the shoulder and bend the end back on itself, to form the beginning of a fagot weld. Make a fagot weld, 1 in. long at the end, and taper and curve the iron as shown on the drawing. Shape the rest of the curve.

Rivet the arms to the center rod, using 3/16-in. rivets.

The candle cups are turned on the lathe, according to the dimensions given. The large washer is drilled ⅞ in. to slip over the ridge on the end of the cup. To fasten the washer to the cup, heat the end of the cup, place the washer in position, lay a large steel ball or place the ball end of a machinist's hammer over the hole, and strike it with a heavy hammer so as to bend the ridge outward over the washer, thus riveting or clamping it tightly to the cup.

Slip the cups over the ¼-in. diameter part of the rods and arms. Place a long, tapered, blunt-pointed punch over the part of the ¼-in. rod that projects inside the cup, and strike the punch with a hammer so as to rivet the cup in place.

Give the finished candelabrum two coats of flat black paint, and spot the surface, after applying the second coat, with gold bronzing powder.

Try several sizes of candles in the candle cups, to see which look best. Long, tapered candles are recommended.

SCREW DRIVER

Dean Smith, Kern County Union High School and Junior College, Bakersfield, California

The screw driver shown herewith, is a fine project for teaching the methods and tools used in working materials other than metals. A pleasing effect may be obtained by inserting pieces of bakelite at intervals in the handle, instead of making it entirely of leather. The chances are that the lathe in which the work is turned will be a small one, and the fastest speed will be needed to get a clean surface on the leather. Shellac will give a protecting coat as a final finish.

FINISHING SCHOOL DESKS

Glenn H. Osborne, High School, Ottumwa, Iowa

During the past two summers we have had occasion to refinish 2,500 desks. Rather than take the desk top off and run it through the surfacer (which we do not have), the board bought a portable sander which cleaned up the tops, most of which were cherry and maple, very nicely.

Many of them had holes cut through which were from ⅝ in. to ⅞ in. in diameter, and these we filled with plastic wood. Yesterday I looked at a top that had 36 holes in it of various sizes which we fixed up last summer and the holes we filled were almost impossible to see through the finish.

After the desk tops were all sanded, Johnson's dark-oak stain was applied. After this was dry, three coats of a good varnish were given to the desk tops, sanding lightly between coats and after the final coat.

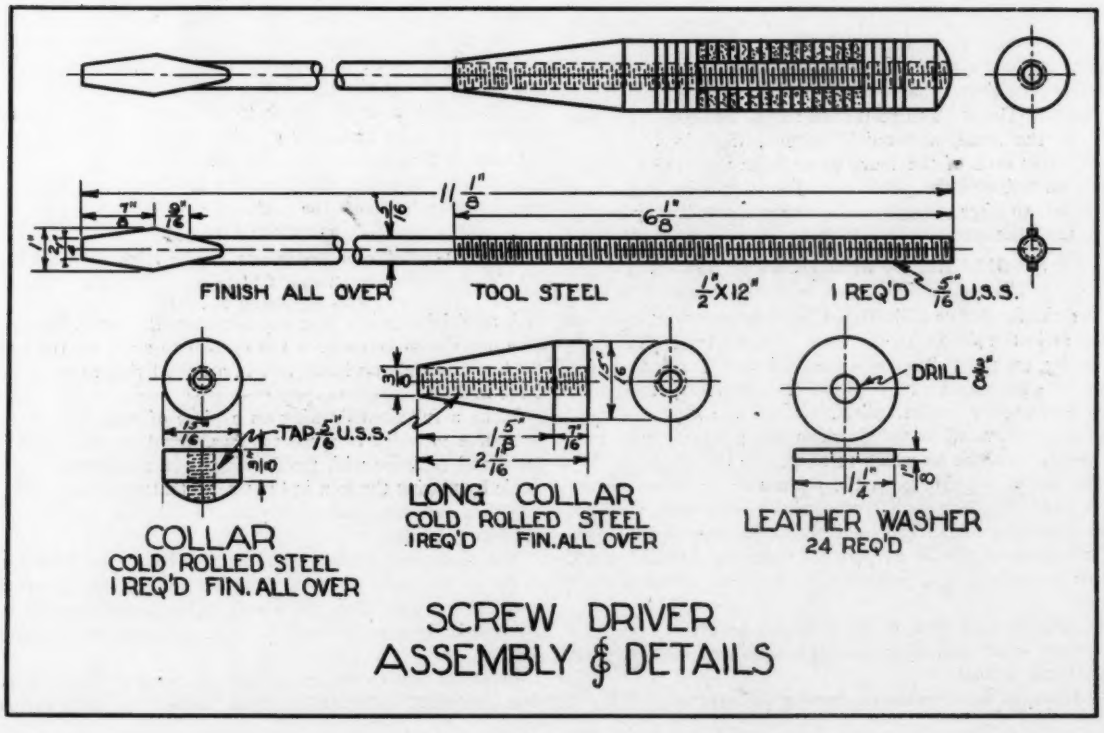
Of course, the best thing to do is to take the seat up entirely and scrub it all over and then refinish it, but for a quick way of doing the job and making a good surface on which to write, we have had excellent results with the method above. This way it cost about 28 cents a seat to refinish, including the material and the labor.

STENCIL DESIGNS FOR FURNITURE

D. Elizabeth Roberts, Philadelphia, Pennsylvania

Stenciling is an easy and satisfactory method of decorating painted furniture. One design may be used for a whole set, that is, for the chairs, the table, the magazine rack, the desk, etc., using the whole stencil on the larger pieces, and a part of the stencil where a small design is required. In this way a single design will serve for the decoration of a breakfast set, using the whole design for the table and a portion for the chairs.

After the design has been made, it must be transferred to the stencil paper, and then cut out with a sharp knife. Oil paints should be used for the stenciling colors, mixing them with a small amount of turpentine to the consistency of a



heavy cream. Be careful to mix enough of each color to finish the work. Use either a round or flat bristle brush, being sure that a clean one is used for each color. Hold the stencil firmly with the left hand on the space to be decorated, and use the brush as dry as possible, applying the paint with a rotary motion. If one stencil is used for all the colors, a paper mask, showing just the spaces to be colored, may be held over the stencil. When the work is finished, lift the stencil carefully.

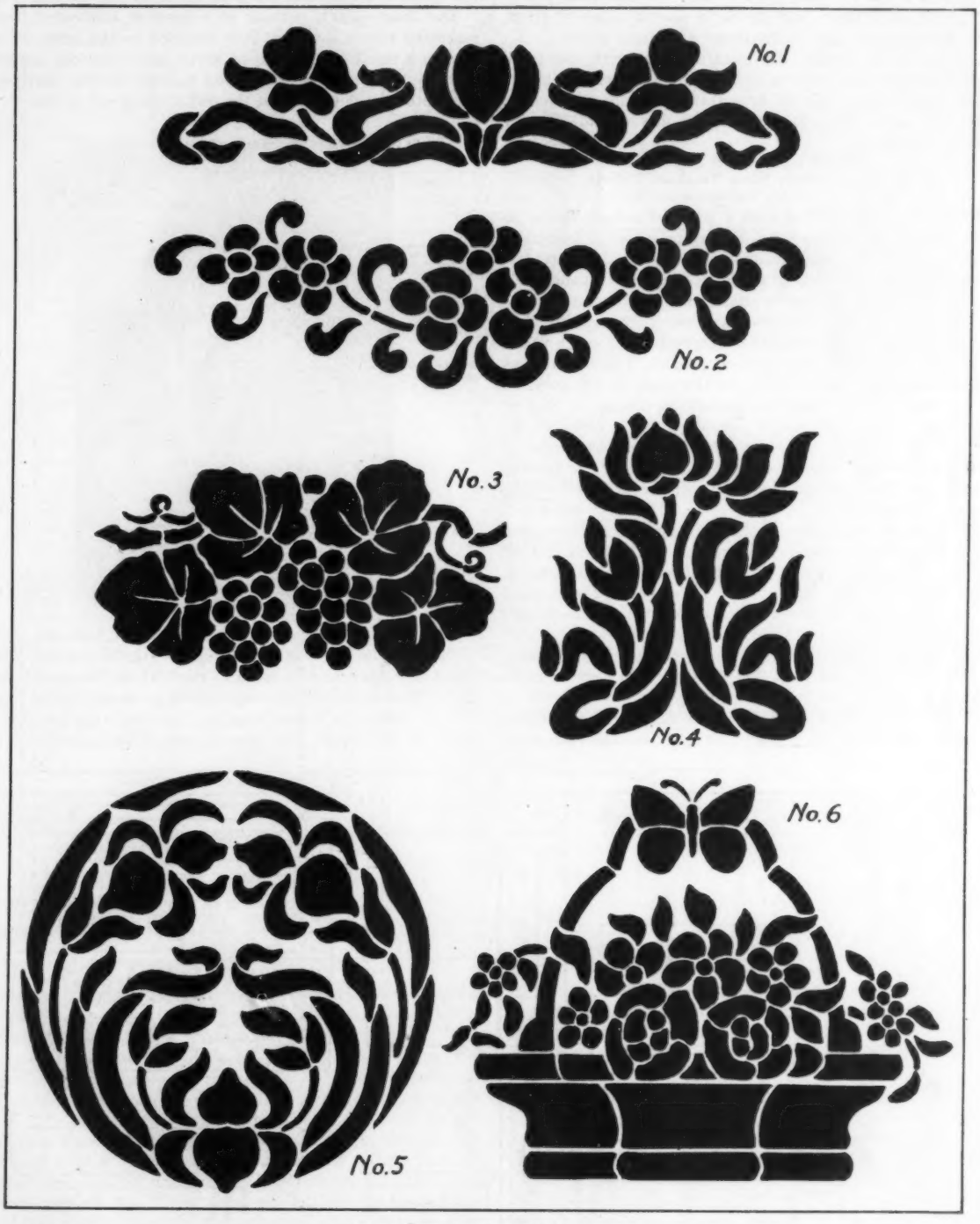
Designs Nos. 1, 2, and 3 are suitable for breakfast sets, and are arranged so that part of a design may be used, if a small stencil is desired.

For No. 1, the crocus design, the flowers may be purple or yellow and the leaves and stems two tones of green.

For No. 2, which is a very conventional design, a number of color schemes may be used. A good combination would be two shades of rose with yellow centers for the conventional flowers, brown for the stems, and green for the scrolls, which take the place of leaves.

For No. 3, the grape design, a purplish blue is used for the grapes, brown for the stems, and a clear green for the leaves.

Designs Nos. 4, 5, and 6 are suitable for a bedroom or den



FURNITURE STENCIL DESIGNS

set, using either two sizes of stencils, or part of the design where a small stencil is required.

No. 4, the tulip design, is attractive with red flowers and several tones of green for the leaves, but any other color scheme may be used as well.

In No. 5, the iris design, the flowers could be blue, yellow or purple, with stems and leaves in several tones of green. The lower part of this design forms a separate stencil.

In No. 6. the basket, the roses could be pink, the small forget-me-nots blue, and the other flowers yellow. The basket could be a light shade of brown and the butterfly yellow. Where a small stencil is required, the flowers and butterfly could be used.

DRUM AND DISK SANDER

David F. Jackey, State Teachers College, Chico, California

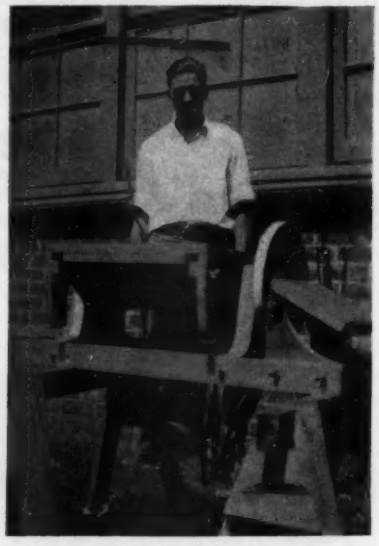
Every shop has need of both a disk and a drum sander to take care of the smaller jobs. Not every school is financially able to purchase a machine that is made for this purchase. The State Teachers College at Chico, California, found itself unable financially to buy a sander. We therefore set about in our general-shop organization and curriculum-making class to design a sander that would be inexpensive and which would also offer a splendid general-shop project. The illustrations and description given herewith, are the result of our work.

Referring to the assembly drawing one can get an idea of the capacity and the proper assembly of the parts of the sander. Part No. 4, the adjustable table, can be placed at any angle from 90 deg. to 45 deg. The table for the sanding drum can be raised and lowered to fit the demands of the work to be sanded.

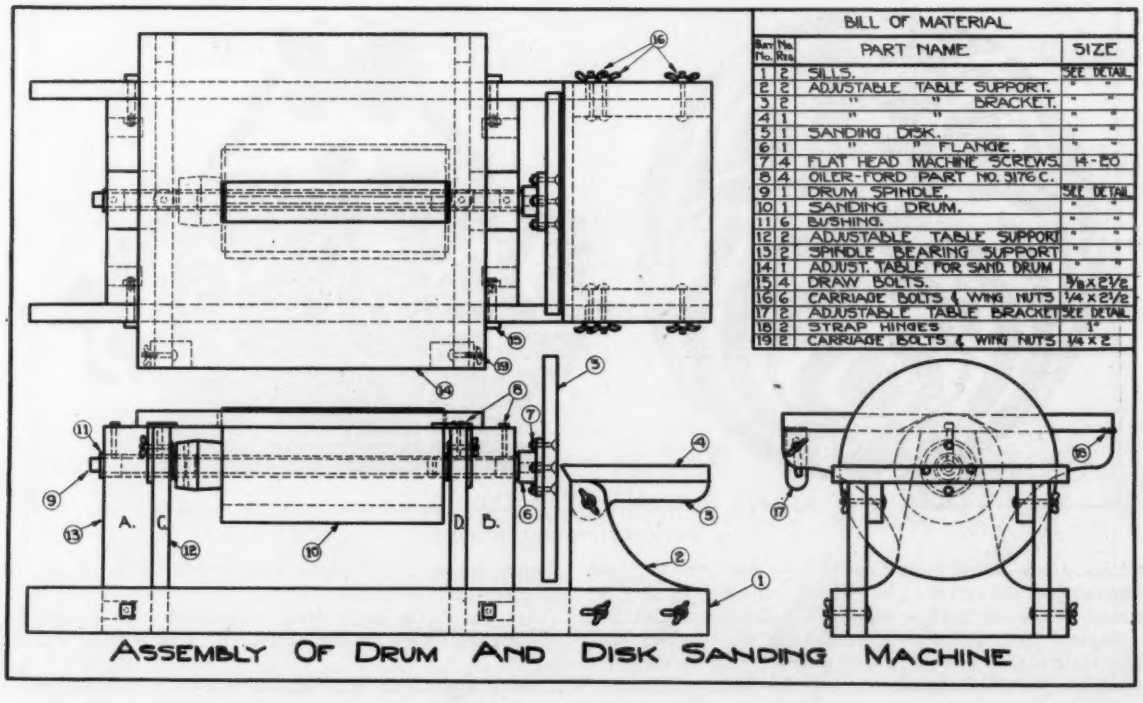
The two pieces for the sills should be made first, from some hard wood, such as oak. They constitute the main support of the machine and should be made of well-selected material. The spindle bearing support may be made of 2⅝-in. hard wood or by gluing up several pieces of select pine. The adjustable table supports and the table tops should also be hard wood, as the continued use to which they are placed makes a soft wood unsatisfactory. The sanding drum may be made of select pieces of white pine glued together.

The metal parts of the machine are simple and can be easily constructed. In the first machine we made, the table brackets, No. 17, were made of wood, as may be seen in the halftone, but we found these to be easily broken and we have therefore made metal ones, as shown in the details. One might even use a small adjustable window bracket in place of these metal brackets. However, since this is to be a general-shop project, the metal brackets can easily be made by the average boy.

The drum spindle is made of a piece of cold-rolled steel, machined with a shoulder. It is threaded on the same end to receive a small faceplate upon which is screwed the sanding disk. By turning a shoulder and threads on the shaft we eliminated the possibility of the disk running out of true.



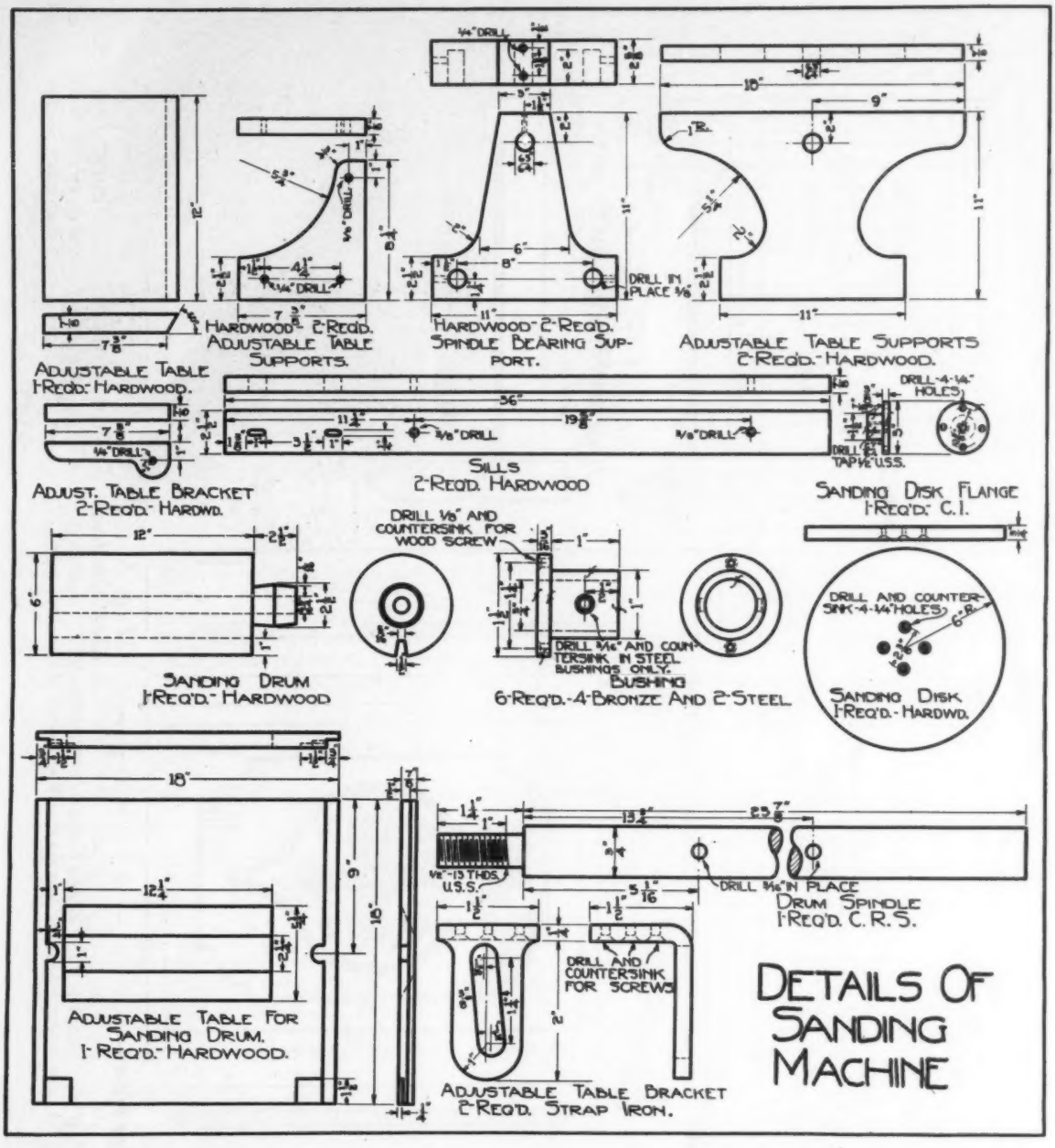
The four bronze bushings may be bought from an automotive supply house or turned up as a lathe project. Two other bushings are to be made of steel. These two steel bushings are to be drilled and countersunk as shown in the illustration, while the bronze bushings have only the two small holes in the flange. The four bronze bushings are used as



BILL OF MATERIAL

Part No.	No. Req.	PART NAME	SIZE
1	2	SILLS.	SEE DETAIL
2	2	ADJUSTABLE TABLE SUPPORT.	" "
3	2	" " BRACKET.	" "
4	1	" "	" "
5	1	SANDING DISK.	" "
6	1	" " FLANGE.	" "
7	4	FLAT HEAD MACHINE SCREWS.	14-20
8	4	OILER-FORD PART NO. 3176 C.	
9	1	DRUM SPINDLE.	SEE DETAIL
10	1	SANDING DRUM.	" "
11	6	BUSHING.	" "
12	2	ADJUSTABLE TABLE SUPPORT	" "
13	2	SPINDLE BEARING SUPPORT	" "
14	1	ADJUST. TABLE FOR SAND. DRUM	" "
15	4	DRAW BOLTS.	⅜ x 2½
16	6	CARRIAGE BOLTS & WING NUTS	¼ x 2½
17	2	ADJUSTABLE TABLE BRACKET	SEE DETAIL
18	2	STRAP HINGES	1"
19	2	CARRIAGE BOLTS & WING NUTS	¼ x 2

ASSEMBLY OF DRUM AND DISK SANDING MACHINE



bearings in the spindle bearing and adjustable table supports while the two steel bushings are to be riveted to the drum spindle after the drum spindle and disk are in place. This necessitates drilling the drum and spindle while in place. The riveting of the bushing to the spindle on the end nearest the threaded end should be done before assembling the spindle and the sanding drum so as to be able to place the spindle in a rigid position while riveting the pin to the bushing.

The riveting of the other bushing to the spindle must be done after being assembled and after the bushing and drum are in place. If this should prove too difficult, the pin through the bushing can be dispensed with as the riveting of the other bushing provides enough strength to turn the disk.

The bronze bushing should be drilled in place for the Ford oilers No. 3176C.

Assembly

The spindle bearing and adjustable table support parts A and C are fastened together by gluing and with screws, with the bronze bushings in place. These are then placed in position and the sills bolted fast. Next, the assembling of the drum sander and spindle, with the bushings fastened to the drum by means of wood screws through the flanges of the bushings, is placed in position.

Next, parts D and B are fastened together same as A and C, and slipped into place over the drum spindle and bolted fast. Then the sanding disk and faceplate is screwed on to the spindle. Next, parts Nos. 2, 3, and 4 are assembled and placed into position, thus completing the assembly. The oil holes are then drilled into parts A and B, C, and D and oilers fastened. Any ¼-h.p. motor will run the sander.

MINIATURE PANELED CHEST

Ken. F. Shepardson, High School, Moscow, Idaho

The miniature paneled chest shown herewith, was designed last fall. Some of the students at once decided to make similar, but larger chests. The project was then drawn up with suggestive designs. The students chose the type of legs shown

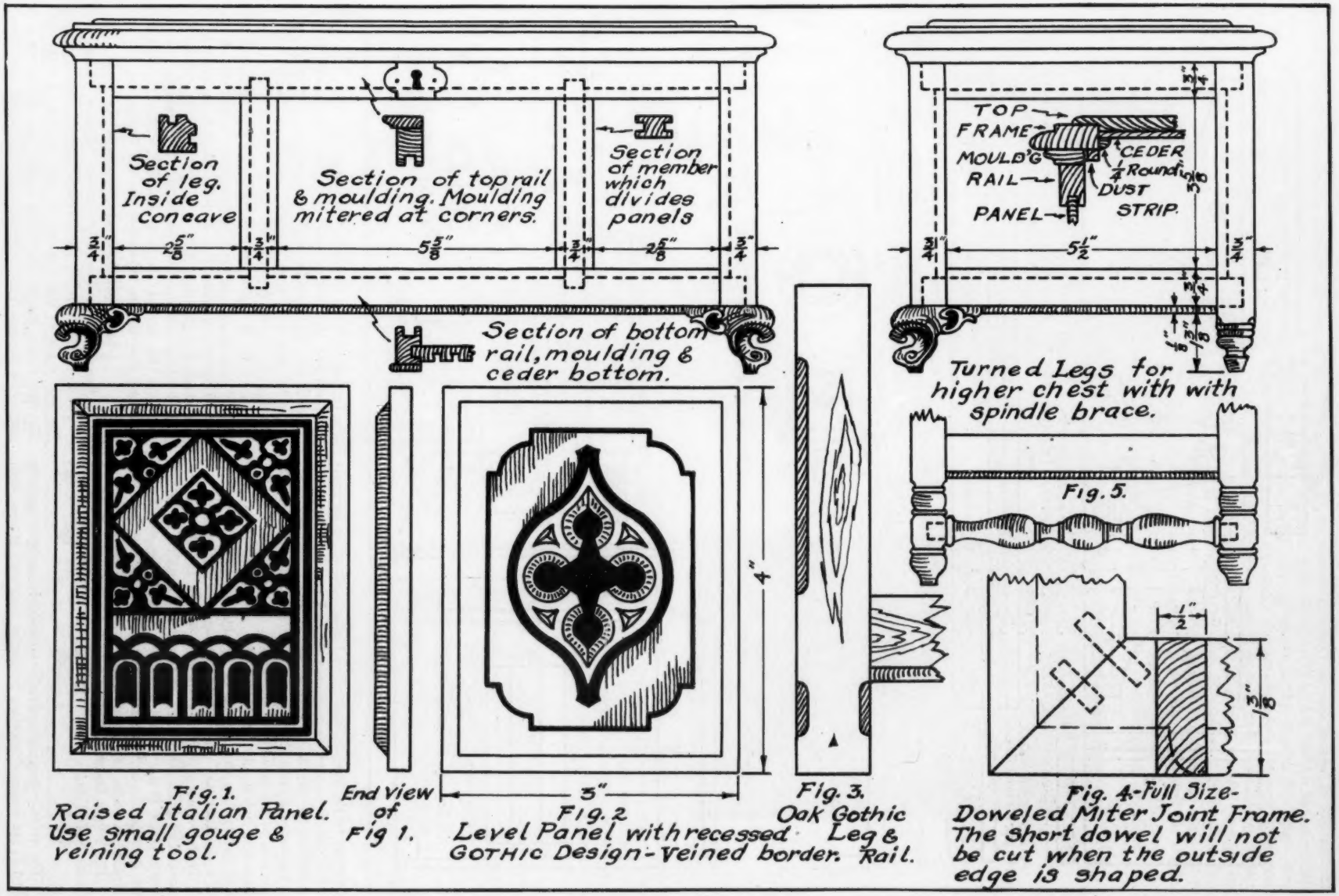


Fig. 1. Raised Italian Panel. Use small gouge & veining tool.

Fig. 2 Level Panel with recessed GOTHIC Design - Veined border.

Fig. 3. Oak Gothic Leg & Rail.

Fig. 4-Full Size- Doweled Miter Joint Frame. The short dowel will not be cut when the outside edge is shaped.

MINIATURE PANELED CHEST

in Figure 5 and the style of panels shown in Figure 1. The center panel is wider than the two outside panels. The design is the same in the center panel, but because of the greater width, the shape of the upper half is a diamond instead of a square.

The panel in Figure 2 shows a design which harmonizes well with the leg shown in Figure 3. The center panel in this case could be the same as the end panels in design except the position of the design would be horizontal instead of vertical, to fill the space.

A chest with plain panels would, of course, be less work and yet would be attractive. A chest with four small panels of equal size would look very well balanced.

If a typical Spanish chest is desired, the top of the chest may be covered with red leather (genuine or imitation) and the edges studded with brass upholstered tacks. The Spanish panels may be lacquered red and sandpapered when dry. This would leave the low parts of the design red which would harmonize with the top. If the top is to be covered with leather, it may be made of cedar. If the top is not to be so covered, a thin piece of cedar may be held in place underneath with quarter round. The outside edge of the frame should be shaped after the frame is glued up.

The most suitable wood for a chest of this type is walnut or gumwood. The Gothic style may be worked up to the best advantage in oak and finished a silver-gray, weathered oak, or driftwood.

The miniature chest shown in the photograph is walnut, with end and back panels of gum. The bottom is cedar, and the underpart of the top is cedar. The lower part of the design is finished a dark red, and the top has a veined border line which is finished in red.

The miniature chest makes a convenient place to keep private letters, smoker's supplies, and odds and ends. This project is valuable for illustrative work in chest construction.

GRADE-SCHOOL SUPPLY CASE

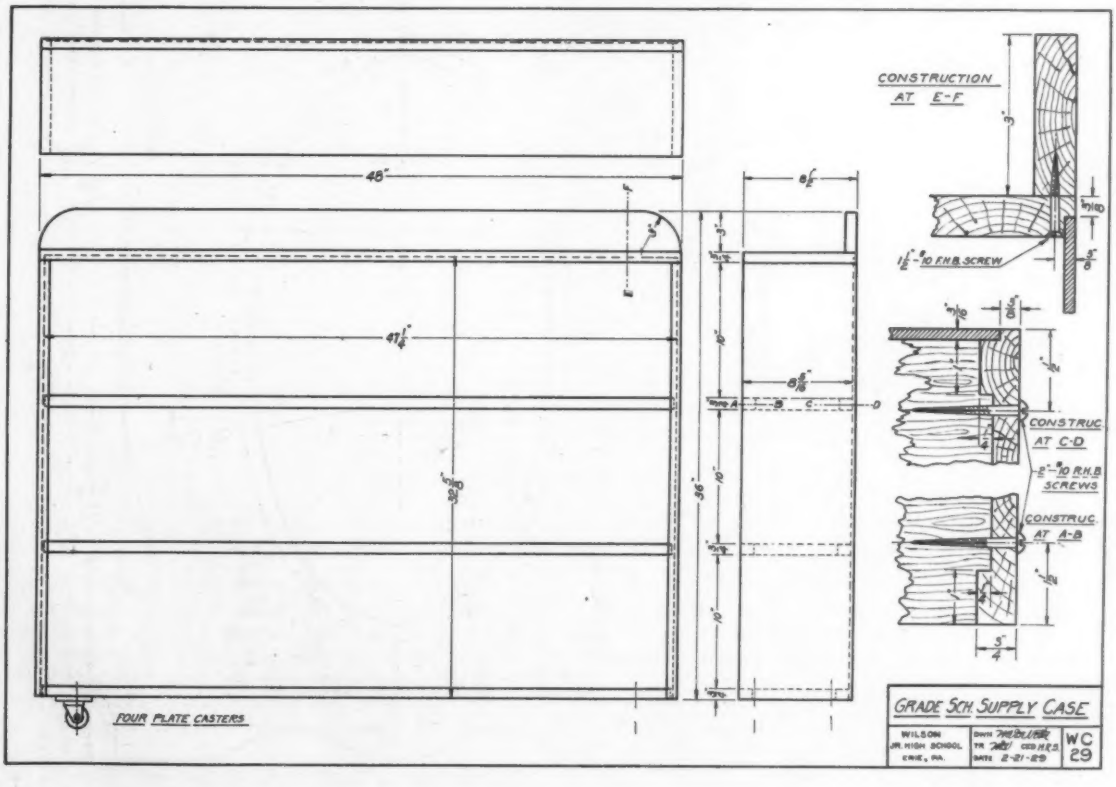
W. A. De Vette, Wilson Junior High School, Erie, Pennsylvania

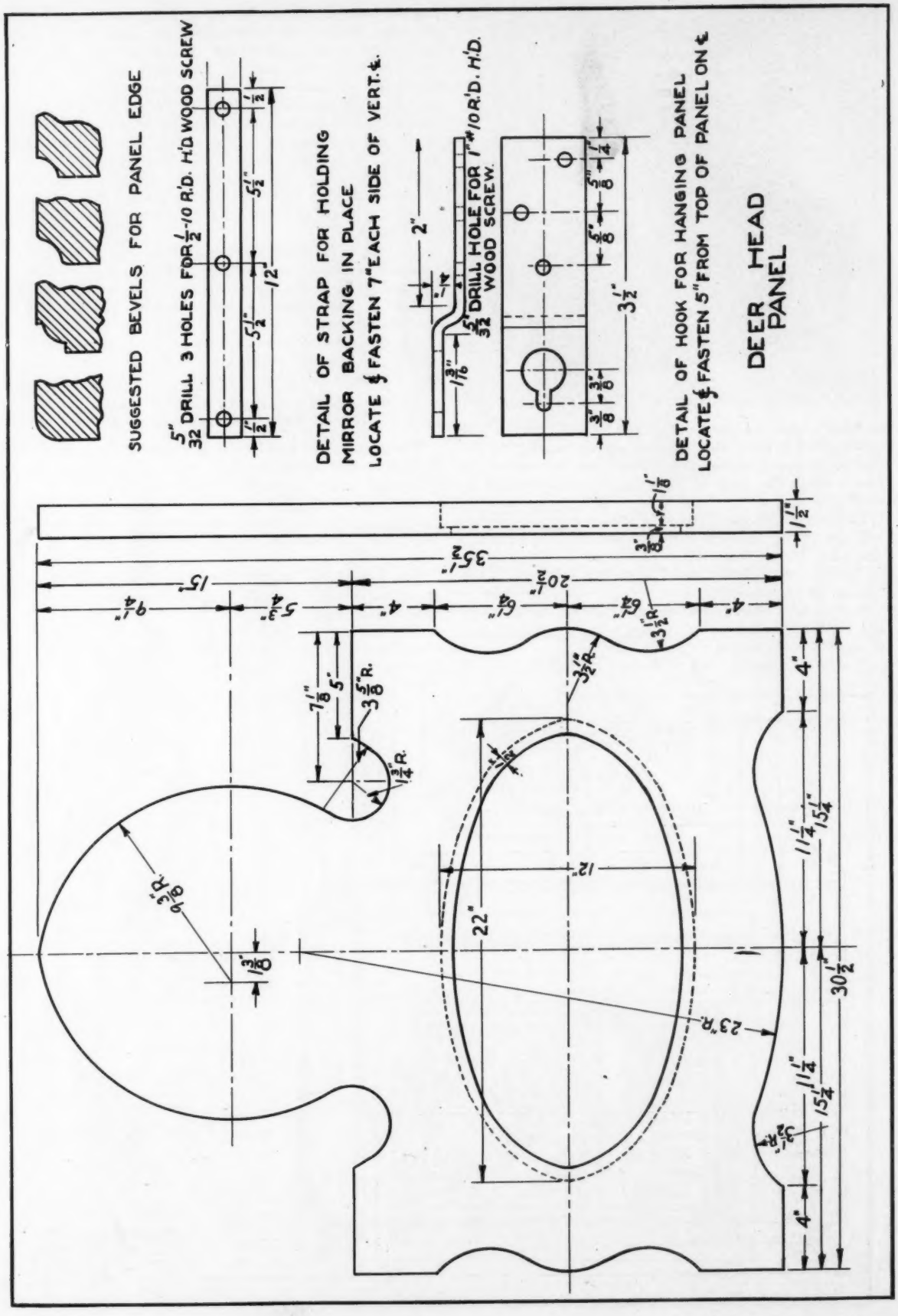
The grade-school supply case is made for the purpose of facilitating the passing out and collection of supplies, such as brushes, paints, cups, rulers, paper, etc.

The instructor in the woodshop will appreciate the opportunity of giving this worth-while project to a boy who can not afford the material for an individual project of like proportions.

The selection of the wood and the finish should be such as to match the woodwork of the room where the supply case is to be used.

The back may be made either of plywood or of composition board. The plate casters may be purchased from any hardware store.




SUGGESTED BEVELS FOR PANEL EDGE
5/32" DRILL 3 HOLES FOR 1/2-10 R.D. H'D WOOD SCREW
DETAIL OF STRAP FOR HOLDING MIRROR BACKING IN PLACE
LOCATE & FASTEN 7" EACH SIDE OF VERT.℄
5/32" DRILL HOLE FOR 1"#10 R.D. H'D. WOOD SCREW.
DETAIL OF HOOK FOR HANGING PANEL
LOCATE & FASTEN 5" FROM TOP OF PANEL ON ℄
DEER HEAD PANEL
35½"
20½"
15"
9¼"
5¾"
4"
6¼"
6¼"
4"
3½" R.
3½" R.
7⅛"
5"
3⅝" R.
1¾" R.
3" R.
1⅜"
12"
22"
23" R.
4"
11¼"
15¼"
11¼"
15¼"
4"
30½"
3" R.
1½"
1⅛"

DEER-HEAD PANEL

William Windsor, Jr., Continuation School, Gloversville, New York

Now that the annual fall and winter hunting season is in full swing, some students and teachers of woodworking will start out with the good intentions of securing a fine buck. They may be lucky enough to secure one, and then again they may blame it on "buck fever." Anyway, those who do get one usually have the head mounted.

Why pay a taxidermist a good price for a panel when you can make one yourself? Let him mount the head and fasten it to a temporary board until you can make your panel. It will take only a few hours to cut out and sand the panel. The longest wait is between varnish applications.

The best material to use is a plywood consisting of five layers. The top surface should be of quartered oak, and the core of chestnut. The panel should measure 1½ by 31 by 36 in.

The mirror can be purchased from a plate-glass dealer and should measure 12 by 22 in., and have a 1-in. bevel.

It is best to locate center lines as shown in the drawing, and from these lay out the shape of the panel. A band saw is helpful for cutting out the curved portions. The two rectangular pieces that are sawed out at the top of the panel may be used at some time for, making book ends. Use a jig saw to saw out the opening for the mirror. This elliptical opening should measure 11 by 21 in. If there is a vertical-spindle sander in the shop, use this to sand the inside of the ellipse to a smooth surface.

Turn the panel over so that its face is down, and with a marking gauge set to ½ in., draw a line entirely around the ellipse. The area inclosed by this line should be the same size as the mirror. Cut out a rabbet 1⅛ in. deep, leaving ⅜ in. at the front.

The next job is to bevel the edges of the panel. A hand router, with a beveling tool, will give best results. Carefully sand the edges, to remove any irregularities in beveling.

Then sand the panel with No. 2 garnet paper to remove any small dents that might be in the surface. After this has been done, sponge the wood and sand it, when dry, with 6/0 garnet paper. Do this six times. Sand the edges again with No. ½ garnet paper, taking care not to cut down the bevel.

After the last sanding, apply a coat of natural filler, rubbing it in well with a piece of burlap. When the pores of the wood will not absorb any more of the filler, wipe off the excess and allow the panel to stand for 48 hours. Then apply a thin coat of orange shellac. When dry, sand this down with 6/0 garnet paper. Wipe off all dust and apply a coat of floor varnish. Let this stand for 3 days. Sand lightly with 6/0 paper, and apply another coat of floor varnish. Allow this to stand for 4 days before putting on the hardware.

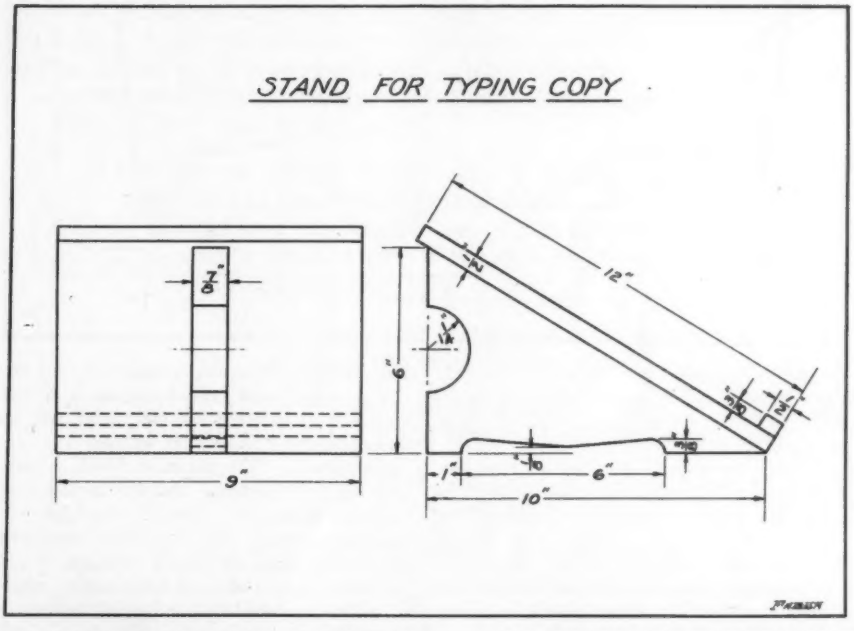
Four 3½-in. r.h.b. wood screws are used to fasten the deer head to the panel. The hook for hanging the panel is located about 5 in. from the top, on the center line of the back. It is fastened with three 1-in. r.h.b. wood screws.

If the panel is to be used for a hat rack, or a gun rack, a deer's foot may be mounted on each of the four corners of the panel in place of the ordinary hat or coat hooks.

A STAND FOR TYPING COPY

Jonathan Bright, Erie, Pennsylvania

The copy stand shown in the accompanying illustration was designed for the typewriting classes. The angle was found by experiment and the size made to suit the standard letter-size paper, 8½ by 11 in. The construction is so simple that no explanation is necessary. The material should, of course, match the desk on which it is to be used.



After the mirror is fitted snugly into place, cut a piece of heavy cardboard, the exact size of the mirror, and place it over the back. Next, cut a piece of soft wood to come flush with the back of the panel. The strap-iron pieces are next located so that each strap will have two screws set into the back of the panel and one into the soft wood covering the mirror. The mirror may then be removed until the panel is finished.

Turn the panel front side up again, and round the edges of the mirror opening with a wood file and fine sandpaper.

MODERNISTIC WHISK-BROOM HOLDER

John McGrath, Batavia High School, Batavia, New York

The modernistic whisk-broom holder has proved to be one of the most interesting problems in the seventh-grade metal shop.

This project is easy to make, yet it involves the principles of cutting, bending, and tracing. A pattern is given to each pupil and he traces it on 22-gauge galvanized iron. The finished job is quite striking, especially when it is enameled in bright colors.

URGES JOB GUIDANCE FOR ALL PUPILS

Declaring that individual students, unaided by information and advice, cannot themselves select the occupations for which they are best fitted, Prof. Harold F. Clark, of Teachers College, Columbia University, speaking recently at the annual October conference of the teachers' union auxiliary, at Lake Hopatcong, N. J., said that education must take an active part in providing adequate vocational guidance.

Professor Clark brought out the fact that education has trained its students to think in terms of production, but has failed to train the correct number for each occupation. He attributed the present business slump to the failure of educators to emphasize the distribution and consumption of goods, as well as production.

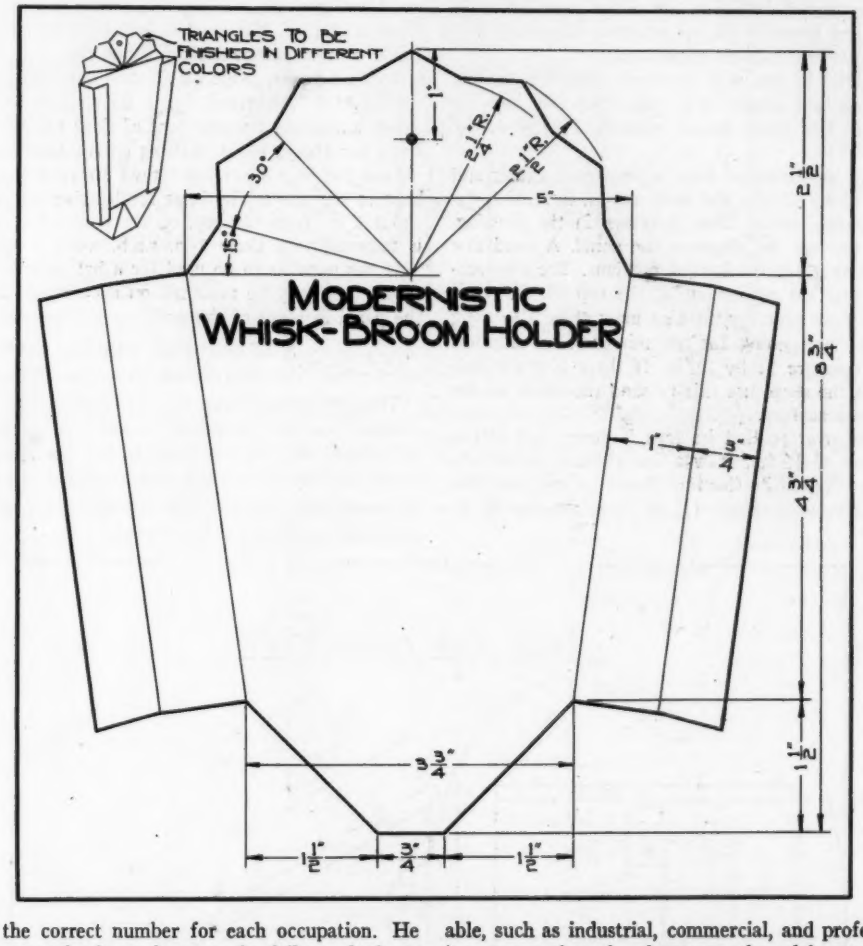
Speaking on the remedy for the present situation, Professor Clark said that there must be concerted planning through the educational, economic, and political system. No phase of this is more important, he said, than the training of the proper number of people by the school system. In fact, he said, it is not too much to say that earned income might be fairly distributed by the simple process of training an adequate number of people for each occupation.

STANDARD CERTIFICATION OF VOCATIONAL GUIDANCE COUNSELORS URGED

At a meeting of the National Vocational Guidance Association held at Atlantic City, February 20–22, a committee on Standard Certification of Vocational Guidance Counselors reported the results of a two-year's investigation and made recommendations dealing with the personality and maturity, experience, education, and type of certificate to be granted to guidance counselors.

Personality and Maturity. The committee was of the opinion that candidates for guidance certificates should possess the ability to work with men and women in a way to inspire and keep their confidence and also show the ability to meet people, to take the initiative, and to deal with situations as they must be met in a counseling position. The age limits for the position were suggested as 25 to 40 years.

Experience. In the field of experience, five years was considered by the committee as the time necessary for a proper background. Various types of experience were cited as valuable, such as industrial, commercial, and professional, including personnel work; classroom, shop, laboratory, or administrative work in grade schools; social case work; participation in local surveys and report writing.

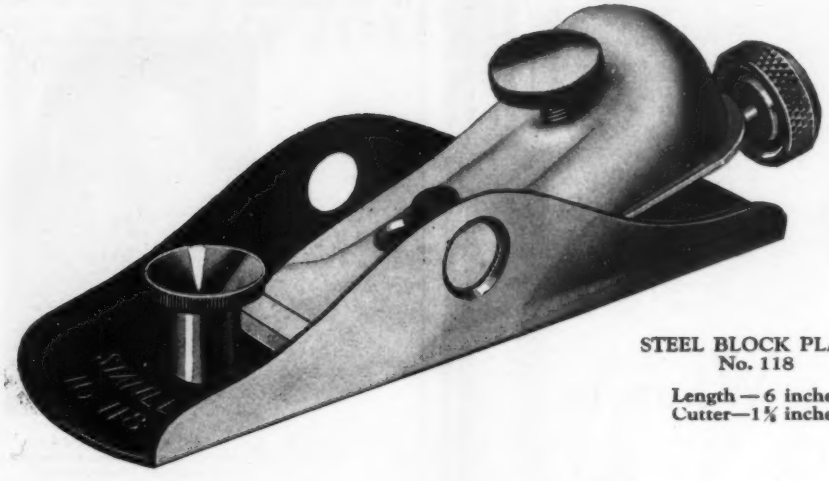


Certificates. The guidance certificate was to be based on personality, experience, and the completion of the following courses, totaling 12 credits: Principles of teaching, educational psychology and educational measurements, 6 credits; educational and vocational guidance, 2 credits; vocational activities or occupational information, research and surveys, 2 credits; methods of imparting occupational information, 2 credits.

The certificate should be made valid for three years. Renewals of certificates were to be granted on a completion of six credit hours of work in an enumerated list of courses, dealing with economics, sociology, psychology, and education.

The committee recommended that the full certificate should not be attained until the candidate had met the requirements dealing with personality and experience, served two years satisfactorily as a counselor, completed the undergraduate work, and in addition 12 credit hours in certain enumerated courses.

Woodworking instructors helped us to design this Steel Block Plane



STEEL BLOCK PLANE
No. 118

Length — 6 inches
Cutter—1⅝ inches

THIS is an acknowledgment with thanks for their help. A simple, "boy proof" block plane for the school shop was requested. After experimenting with several designs, the No. 118 All-Steel Block Plane was approved.

The School Block Plane has a minimum of parts and is practically unbreakable. The cutter is held at a low angle. Lever cap is made of steel and is fitted with a large thumb screw that cannot be lost from the cap.

The finger rest is permanently fixed. No mouth adjustment or lever cap screw.

We recommend this Steel Block Plane as being the ideal block plane for school use.

This useful tool is among the many described in our Tool Catalog No. 34. Have you a copy?

THE STANLEY RULE & LEVEL PLANT
Educational Department
New Britain, Conn.

STANLEY TOOLS

Stanley Equipment is Standard Equipment

When is a Hole Larger than the Drill?

For the answer to this question, refer to page 16 of the "Handbook for Drillers," a 48-page textbook on twist drills and drilling practice. You will find in the "Handbook," in addition, answers to dozens of other questions which enable machine shop instructors to teach the correct use of twist drills.

To help further a better knowledge of twist drills and how to use them properly, we are always glad to send copies of the "Handbook" to school directors and instructors in any reasonable quantities for class use.

A new edition of the "Handbook" is now ready.

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SAN FRANCISCO

AMONG the INDUSTRIAL ARTS TEACHERS

THE NEW SECRETARY OF THE EASTERN ARTS ASSOCIATION

Mr. Burton A. Adams, supervisor of manual arts, Springfield, Mass., was recently elected secretary of the Eastern Arts Association, to succeed the late Frank A. Mathewson. He will serve until the next regular election in 1931.

MR. B. A. ADAMS
Secretary, Eastern Arts Association,
Springfield, Massachusetts

Mr. Adams is a graduate of the Massachusetts Institute of Technology. He has been connected with the Springfield schools since 1900, and has filled the position of supervisor of manual arts since October, 1919.

Mr. Adams is an active member of the Eastern Arts Association and has attended its annual meetings regularly since its organization.

APPOINTED PRINCIPAL OF NEW TECHNICAL HIGH SCHOOL

Mr. John F. Jeffery, formerly principal of the Strong Vincent Evening Schools, has been elected as principal of the Technical High School at Erie, Pa.

MR. JOHN F. JEFFERY
Principal, Technical High School,
Erie, Pennsylvania

Mr. Jeffery is a graduate of Bucknell University in the class of 1916 and holds two degrees given by the institution. For the past ten years he has served as an instructor in the Erie schools, and for two years was an evening-school principal.

(Continued on Page 24a)

Bring to Youth the Best

THE REGAL, a geared head lathe with eight selective speeds, is especially designed for vocational training and light manufacturing. Designed for accurate reproduction, simplicity of operation, and above all SAFETY to the operator.

The Regal Lathe passes the same standards of inspection and tests as the world famous LeBlond Lathes, with the same guarantee of workmanship and accuracy.

Note the clean-cut construction of the 8-speed geared head . . . typical of modern machine tool practice. It is an important safety feature.

Motor mounted on leg—multiple V-belt drive.

Write for complete details of the LeBlond Regal Line.

SIZE
10" X 3'
$398.00

Regal Lathes are made in a range of sizes to meet all requirements. Fully equipped, including motor.

THE R. K. LEBLOND MACHINE TOOL CO.
REGAL DIVISION ▾ CINCINNATI ▾ OHIO ▾ U.S.A

Johansson
Gage Blocks and Accessories

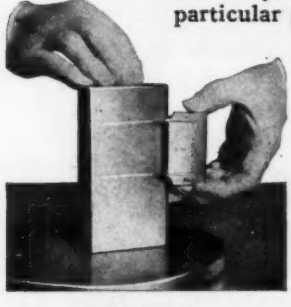
do measurement of length operations that cannot be performed economically by other methods

AUXILIARY SET NO. 77 *consists of 22 accessories*

JOHANSSON accessories, in conjunction with the Johansson Gage Blocks, increase the use of Gage Blocks more than three hundred per cent by making available:

- Height gages for scribing and checking locations from a known base.
- Gages for checking inside and outside dimensions of length.
- Gages for scribing arcs and circles.
- Trams for rechecking location lines.
- Multiple applications of a straight edge.

Workmanship of a high standard is the result of mechanics using the Johansson Gage Blocks and Accessories to measure dimensions of length. We will be pleased to tell you how they can be applied to your particular gaging problems.



Send maximum and minimum dimensions of length, with closest working limit.

Available in three accuracies.

Delivery from stock.

Prices and literature on application—order direct or through your mill supply dealer

C. E. JOHANSSON, *Inc., Division of*

FORD MOTOR COMPANY

Detroit, Michigan

(Continued on Page 28a)

He was formerly employed in a number of Erie industrial concerns through which he gained broad industrial contacts in several lines of work. He is the author of a number of textbooks for school-shop use.

¶ MR. HERBERT J. MAXWELL, teacher of manual training in the Franklin Junior High School, Racine, Wis., died recently at St. Luke's Hospital, following an operation. Mr. Maxwell had been connected with the Racine schools for six and one-half years.

¶ MR. JAMES S. ARMSTRONG, 59, manual-training instructor at the Grant School, Milwaukee, Wis., died at his home, after a short illness. Mr. Armstrong had been teaching in the Grant School for the past twelve years.

¶ MR. J. D. HICKEY, 73, president of the board of directors of the Milwaukee Vocational School, Milwaukee, Wis., died recently at the home of his son, Dr. Clement M. Hickey, in Whitefish Bay. Mr. Hickey was on the board of the vocational school for a number of years.

¶ MR. JOHN KLATT has been appointed as a member of the board of industrial education at Milwaukee, Wis., to succeed the late J. D. Hickey.

¶ DR. JOHN E. HARRIS, formerly professor of organic chemistry in the University of North Dakota, has become a member of the faculty of the derived products section of the United States Forest Products Laboratory at Madison, Wis. Dr. Harris will devote some time to the Federal laboratory study of lignin, which was recently inaugurated on an extensive scale. Dr. Harris holds two degrees given by the University of Minnesota.

¶ MR. J. A. KENNEDY and MR. J. M. TAYLOR have become instructors in industrial subjects at Richmond, Va. Both men are graduates of Clemson College at Clemson, S. C. Mr. Taylor was for the past two years an instructor in the high school at Lyman, S. C.

¶ MR. J. A. BOYD has become a member of the staff of the textile department of Clemson College, Clemson, S. C. The increase in the staff was made necessary by the increased enrollment in the special courses of textile chemistry, rayon, and dyeing. Considerable new equipment has been installed in this department to offer students the latest training in these subjects.

¶ MR. HAROLD BROWN, a graduate of the San Jose State College, has been appointed instructor in mechanical drawing and shopwork in the high school at Pittsburg, Calif.

¶ MR. KENNETH ARCHIBALD has been appointed as instructor in woodwork in the junior high school at San Diego, Calif. MR. BERTRAND CAROLYN has been appointed teacher of electricity in the same school.

¶ MR. FRED COBURN has been appointed instructor in farm mechanics at Hamet, Calif.

¶ MR. LEWIS DEASY has been appointed instructor in woodwork in the grammar school at Los Gatos, Calif.

¶ MR. DAVID DICKY has become instructor in electricity in the junior high school at San Diego, Calif.

¶ MR. DONALD FILLMORE has been appointed instructor in auto mechanics in the junior high school at San Francisco, Calif.

¶ MR. RICHARD J. FOX has been appointed instructor in woodwork at Sunnyvale, Calif.

¶ MR. CHARLES FERRELL has been appointed instructor in auto mechanics at San Louis Obispo, Calif.

¶ MR. EMIL BANSMER has been appointed instructor in woodwork in the Los Lometa School at Palo Alto, Calif.

¶ MR. C. W. PEAVEY, formerly teacher of auto mechanics at San Antonio, Tex., has been promoted to the position of coördinator for all Smith-Hughes trade classes.

¶ MR. C. E. TROUTZ, formerly manual-training teacher at Breckenridge, Tex., has been elected principal of the evening schools at San Antonio, Tex.

NOW, ARE THERE ANY QUESTIONS?

Auto Engine Converted to Marine Uses

932. Q.: Where can I get a book or information on how to convert an automobile engine into a marine engine? — *C. S. R.*

A.: When converting an automobile engine into a power plant for a motor boat, little need be done beyond securing a hook-up to the propeller shaft and making provisions for cooling.

Ordinarily cooling is secured by means of a gear-type pump which may be purchased from jobbing concerns handling machine-shop, railroad, or similar supplies. After the gear-type pump, which should have ½ to ¾ outlet and inlet capacity, has been secured, a special bracket must be made on which the pump is to be mounted. The pump may be mounted on the ribs of the boat or at some other place near the power plant. Ordinarily the drive which is used for driving the fan may be used for driving the gear-type pump. No fan, of course, need be used.

In some cases the old centrifugal pump is removed (I doubt if this would work in the case of the Nash) and the impeller or accessory drive shaft is connected directly to the new gear-type pump shaft, with a short length of hose and thus driven.

The transmission may be discarded or used, at the convenience and desire of the builder. If the transmission is used, then it should be rebuilt so as to give a faster reverse speed and but two shifts retained; that is, direct drive or forward in high, which is a 1 to 1 ratio, and about a 2 to 1 reverse. This requires a little ingenuity but has been done in certain cases by builders.

Another method of taking care of reverse is to install one of Joe's reverse gears or equipment similar to this. These can be secured from motor-boat supply houses. When the reverse-gear set is used, it is mounted back of the flywheel of the engine and in line with it. Universal joints must be used in such a hook-up.

I would suggest that you get some back issues of *Motor Boat* or a similar magazine from which you will get many suggestions, both from the editorial and advertising pages.

The clearances allowed in building up an engine for marine use and for automobile use are approximately the same. In Cincinnati we prefer to use the cast-iron piston, rather than the lightweight, since the engine is subject to long, hard dragging and the wear will be less rapid with the cast iron than it will be with the aluminum.

Acceleration in a motor boat, except in a speed type, is not of great importance. If the builder is figuring on this job for a speed boat, then, of course, he will want to follow out all of those practices which are ordinarily used in building an auto engine for a job to be used in dirt-track racing; that is, everything must be in balance, and clearances are likely to be just a bit greater, for bearing and piston fit.—*Ray F. Kuns.*

ASSOCIATION & CONVENTION ACTIVITIES

ILLINOIS VOCATIONAL ASSOCIATION MEETS

The largest and most successful meeting of the Illinois Vocational Association was held November 7–8, at the Hotel Sherman, Chicago, Ill. Mr. William J. Bogan, president of the association, presided.

Correct shop practices begin with correct *tools*

THE grip, the feel, the performance of a tool gives confidence to the inexpert hands of your boys.

Give them Plumb Hammers, the choice of good workmen everywhere.

For a Plumb has a full face for accurate nail driving. The weight is centered in the head to give the tool a natural fall. The sharp nipper claws will bite and pull the slimmest headless nail. The special claw curve gives greater leverage to help draw stubborn nails.

And a Plumb has balance—that "something" in the feel of a hammer that makes it seem part of your arm.

Made of finest Plumb Steel, tempered scientifically with modern electric equipment. Fitted with selected strength tested hickory handles.

Specify Plumb, with the Red Handle and Black Head, for long service in your school shop.

Fayette R. Plumb, Inc
Philadelphia, U. S. A.

PLUMB
DOUBLE LIFE
Hammers Hatchets
Files Sledges Axes

A safety feature found only in Plumb Tools

Plumb solved the loose handle problem after years of experiment. Not by developing a wedge to keep handles tight. No wedge does that, because wood will shrink. But Plumb gives you the patented Plumb Screw Wedge which enables you to retighten the head instantly, just by a turn of the screw. Every school shop should have this safety feature in its hammers.

Kewaunee brings greater efficiency to mechanical drawing rooms

Use classrooms every period of the day

The art or mechanical drawing room equipped with Kewaunee Furniture can be used every hour of the day. Kewaunee tables accommodate as many as eight classes a day and provide locker room for each student. Every table is solidly built, scientifically designed to be of greatest service and to promote maximum efficiency.

Write for the Kewaunee Book

Your request on the letterhead of your institution entitles you to a copy of the Kewaunee Book. This book shows the complete line of Kewaunee Equipment for Art and Mechanical Drawing Rooms. Write for it today.

It will be a pleasure to show you our exhibit at the N. E. A. Convention, Detroit, Mich., Feb. 21-26, 1931.

Kewaunee Mfg. Co.
LABORATORY FURNITURE EXPERTS

C. G. Campbell, Pres. and Gen. Mgr.
245 LINCOLN ST. KEWAUNEE, WIS.

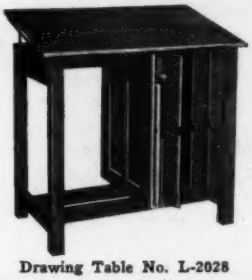
Designers and Manufacturers of Art and Mechanical Drawing Room Furniture for Schools and Colleges

Factories at Kewaunee, Wis., and Adrian, Mich..

Instructor's Table No. L-2062

Art Table No. L-2077

Tool and Board Case No. L-2072



Drawing Table No. L-2028

Drawing Table No. L-2044

(Continued from Page 27a)

Two general sessions were held, in addition to sectional meetings in agriculture, art education, printing, home economics, commercial education, industrial education, part-time education, and personnel and guidance. Among the speakers at the meeting were Mr. Paul W. Chapman of Georgia; Mr. Hamilton Holt, of Rollins College, Florida; Miss Regina E. Groves; Mr. E. W. Barnhart, of the Federal Board for Vocational Education; Mr. Arthur B. Mays, University of Illinois;

(Continued on Page 33a)

GROUP ATTENDING FALL MEETING OF THE WESTERN WASHINGTON INDUSTRIAL EDUCATION ASSOCIATION AT SEATTLE.

Why are

DIETZGEN INSTRUMENTS

the accepted standard in thousands of schools

A Typical Repair Kit

**For each grade of Dietzgen instruments there is a repair kit. Each kit will keep 50 sets in perfect condition.*

One of these repair kits in a classroom which has standardized on a certain grade of DIETZGEN Drawing Instruments makes it possible to keep the drawing instruments of an entire class in first class working condition at all times.

Because . . .

they are accurate

- are durable
- are milled from bars—*not stamped out*
- are made of cold rolled nickel silver

Joints are accurately fitted

Parts are interchangeable

Each process of manufacture is carefully supervised

There is a repair kit for each grade of Dietzgen instruments.*

The instructor who standardizes on Dietzgen instruments helps both student and himself, for good tools are a recognized necessity in the mechanical drawing room.

Write for Special School Catalog No. 30A

Standardize on Dietzgen Standardized Instruments

EUGENE DIETZGEN CO.

Enduring worth at reasonable cost

Chicago New York
New Orleans Pittsburgh
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DIETZGEN ESTABLISHED 1848

Philadelphia Washington
Milwaukee Los Angeles
Factory at Chicago

Manufacturers of Drafting and Surveying Supplies

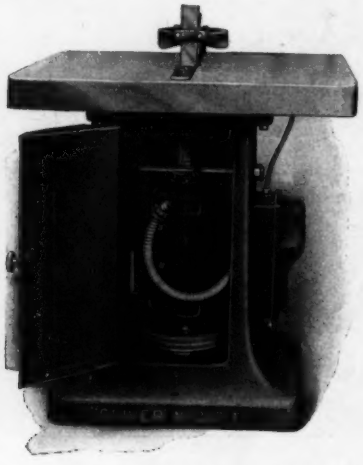
School Shop Equipment News

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

NEW OLIVER WOOD SHAPER AND MOLDER

The Oliver Machinery Company, of Grand Rapids, Mich., has announced a new single-spindle, high-speed, ball-bearing wood shaper and variety molder as an addition to its line of woodworking machinery.

The Oliver 287 shaper has been designed for shops desiring the advantages, the efficiency, and the ruggedness of a two-spindle shaper, but one which is capable of doing the work of a single spindle only.

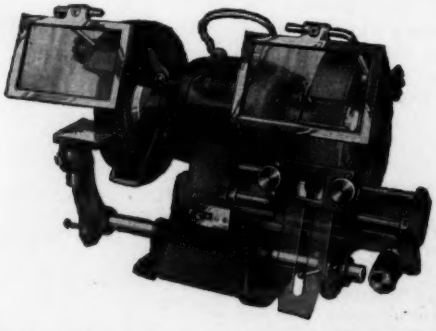


The new shaper has a detachable spindle, with a wick-filter type of oil lubrication, which prevents the dust from entering the ball races. The spindle is arranged with a brake, connected to an automatic cut-off switch, which is operated by a foot lever. A motor on the spindle, with an aluminum fan built into the housing, keeps the motor cool. The motor, yoke, and spindle may be raised or lowered according to the desire of the operator by a simple turn of a handwheel. The machine is arranged for a belted motor drive, operating with a 3600 r.p.m. ball-bearing motor, mounted in a vertical position with an endless fabric belt transmitting the power to the spindle. The design and construction of the machine are intended to economize in floor space and to increase the efficiency comparable to the latest high-speed machines.

Complete information about the Oliver shaper may be obtained by any school-shop instructor upon request.

ANNOUNCE NEW CARTER GRINDER

The R. L. Carter Company, of New Britain, Conn., who manufactures lock mortisers, planes, and machines for a variety of purposes, has announced a new 7-in. grinder for use in grinding woodworking knives, gouges, and chisels.



The grinder has a speed of 1725 r.p.m., and is furnished with a guard which totally incloses the wheels, except at the cutting point of the wheel. It can be furnished with two adjustable toolrests, or with an adjustable toolrest and a floating grinding attachment, which insures a correct position of the knife or chisel for grinding a true edge. The outer side of the guard may be easily removed to allow the mounting of a cone wheel for the grinding of gouges and other circular knives. The grinder is especially adapted for school use, due to the simple, positive adjustments on the plane iron and chisel-grinding attachment, which add to its safety features.

Complete information and prices may be obtained by writing to the Carter Company, at New Britain, Conn.

NEW YATES-AMERICAN SCROLL BANDSAW

The Yates-American Machine Company, of Beloit, Wis., has announced the addition of a new scroll band saw to their extensive line of woodworking machinery.

The new Y-20 band saw is a high-grade machine, rigid and durable in construction, and equipped with aluminum guards for the wheels and the saw blade. A flange surrounding the motor and extending outward 3 in., is cast to the frame and guards against the collection of refuse around the lower wheel. The table is mounted for free and easy movement and can be tilted to an angle of 45 degrees to the right, or 10 degrees to the left. A lock brings the table to the front within easy reach of the operator. A graduated scale insures easy and accurate table adjustment. A spring tensioning device on the upper-wheel shaft, adjustable by handwheel, gives tension to the saw blade. The upper wheel is tilted by special adjustment for easy tracking of the saw. Both upper and lower roll guides are adjustable. The machine is driven by a 1-h.p. motor, with push-button control.

Complete information may be obtained by any school-shop instructor upon request.

ADVERTISING PAGES REMOVED

(Continued from Page 28a)

Mr. J. W. Thompson, state supervisor of industrial education for Illinois; Mr. H. E. Wood, vocational director of Indianapolis, Ind.; and Mr. Earl Bedell, vocational director of Detroit, Mich.

The following officers were elected for the ensuing year:

President, Mr. A. B. Mays, University of Illinois, Urbana; vice-presidents, Mr. E. J. Tobin, Miss Clara Kruse, Mr. W. S. Maxwell, Miss Mary Fuller, Dr. W. T. Bawden, Mr. Warren Hill, and Mr. Robert Woellner; secretary, Mr. D. W. Castle, Joliet, Ill.; treasurer, Mr. N. F. Fultz, Cicero, Ill.; directors, Miss Nellie F. Ryan, Chicago, and Mr. U. G. Willis, Chicago.

There was an exhibit of all kinds of vocational and practical-arts work, as well as a display of commercial products in one of the rooms of the hotel.

THE MEETING OF THE WESTERN WASHINGTON INDUSTRIAL-EDUCATION ASSOCIATION AT SEATTLE

The fall meeting of the Western Washington Industrial-Education Association was held November 1, at Seattle. Mr. Ernest Osgood acted as chairman of the meeting.

The morning session was opened with a talk by Mr. Worth McClure, superintendent of schools of Seattle, which was followed by an address of welcome by Mr. J. M. Kniseley, principal of the Marshall School, both of whom emphasized the educational value of industrial arts in the schools. Prof. S. C. Roberts, of the Washington State College, gave a talk dealing with the history and teaching problems in industrial arts, in which he stressed the importance of hand training in the manipulative skills, dealing with the premise that basic training in the use of hand tools should precede the use of machinery. Mr. F. M. Warner, of the University of Washington, gave a talk on the subject, "Education of Mechanical-Drawing Teachers After Graduation."

At the afternoon session, Mr. George B. Cox, of the Oregon State College, spoke on "Present Trends in Industrial Education and Their Effects on the Training of Teachers." Dean Uhl, of the University of Washington, gave a talk on "The Opportunity for Advanced Work for Industrial-Arts Teachers at the University of Washington." He was followed by Mr. T. R. Hyde, of the Lakeside Country School for Boys, who talked on "The Private School with Reference to Problems in Industrial Arts."

Announcement was made of the preparation of new industrial-arts courses for the state, which were the work of the special committee appointed by the state superintendent.—*Charles Rice.*

NEWS AND NOTES

New South Milwaukee Vocational School

Contracts have been let for the construction of the vocational school at South Milwaukee, Wis. The building, which will cost approximately $100,000, will replace a school destroyed by fire.

New York School Board Approves Survey Committee

The board of education of New York City has recently approved the special committee appointed by Pres. George J. Ryan to supervise a survey of vocational activities in New York City. The purpose of the survey will be to study industrial conditions in the city, with a view of bringing about a closer coöperation between industry and industrial education. The committee is made up of one representative of the board of education, one of the employers, one of the employees, and one of the advisory board on industrial educa-

(Continued on Page 34a)

SAFETY PLUS!

The Diamond Power Cutter Prevents Injuries and Errors and Gives Superior Service!

Challenge-Diamond Power Cutter equipped with Challenge Frazee-Saur Safety Device.

Here's the safest, most economical and highly efficient paper cutter for student or apprentice work . . . . a machine that absolutely prevents accidents to operators and minimizes spoilage.

It's the Diamond Power Cutter, equipped with the Challenge Frazee-Saur Safety Device, a unique feature made exclusively for use on Diamond Cutters. To keep the machine in operation it is necessary to hold *both* levers — no chance for mangled, cut hands. Besides, the clamp arrangement safeguards the operator's hands when working around the stock, and a positive-locking back-gauge eliminates cutting errors. Investigate *all* the features of the Diamond Cutter. Write today for full information and prices — *now!*

"IT'S A CHALLENGE"

Printing Instructors: See your dealer or write for prices and information on the following Challenge Creations:—Lee Two-Revolution Cylinder Presses — Advance Lever Paper Cutters — Hoerner Combination Type-High Machines—Sieber Hand and Foot Punches — Challenge Proof Presses — McGreal Chases — Challenge Portable Routers and Router Vises—Challenge Galleys—Challenge Iron Furniture —Challenge Semi-Steel Imposing Surfaces — Quoins and Keys — Challenge-Mielke Paper Drills, etc., etc.

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How About Your Drawing Department?

Is it producing the kind of results you have the right to expect? Will the equipment stand up against the gaff of everyday usage? Does it possess the durability features which will pay added dividends on your investment?

The E. H. SHELDON & COMPANY has spent many years studying the needs of the drawing departments of schools all over the land, and with this wealth of information they have constructed several types of drawing tables in sizes to accommodate from one to eight classes which are a great improvement over the ordinary type.

When you are creating a new department or re-equipping the old, be sure to get the SHELDON facts *first.*

Send for the newest SHELDON CATALOG.

E. H. SHELDON and COMPANY, Muskegon, Michigan

Specialists in Vocational Training Furniture

(Continued from Page 33a)

tion. Deputy Supt. Harold G. Campbell is chairman of the committee.

Model Airplanes at Morris High School, New York City

An Aero Club has been organized in the Morris High School, New York City. The purpose of the club is to build model airplanes, to visit airports, and to learn the fundamentals of flying and aviation. Each member of the club has a kit of supplies for building model airplanes.

Shops Rent Aprons for Nominal Sum

At the suggestion of Mr. Harry Redman, shop instructor in the Kennard Junior High School, Cleveland, Ohio, the girls in the sewing classes made 48 aprons for shop use. The aprons which were made under the direction of the instructor, Miss Minerva Haywood, are of blue denim, and are rented to the boys for 10 cents a semester.

The shop boys are anxious to wear the aprons, because they keep their clothes clean. They also give the shop a better tone, because they are uniform in pattern and color, instead of being all styles, shapes, sizes, and conditions of use.

Baltimore Issues High-School Syllabus in Art

The department of education of Baltimore, Md., has issued a high-school syllabus in art. The course, which covers a study of six years, provides for a required course in principles and practice of design in the tenth year, with courses in general design in the eleventh and twelfth years. The course makes possible the offering of art as a major subject in the eleventh and twelfth years. The elective courses in design have been planned to meet the cultural and prevocational needs of groups of pupils who may desire to continue their study of this subject.

Under the new plan, graduation from the art major curriculum leads either to college, or to the special art school. It is expected that all senior high schools of Baltimore will eventually adopt the plan, which makes for a more satisfactory differentiation of studies to meet the needs of individual pupils.

American Federation of Arts Held Third Exhibition in New York

The third exhibition of contemporary industrial art, including decorative metal work and cotton textiles, which began in October, provided for a circuit of four museums of art in Boston, New York, Chicago, and Cleveland. The exhibit was held in the Metropolitan Museum of New York on December 1. It included, in addition to the American displays, the work of eight foreign countries. About 939 objects produced by 181 firms and craftsmen involving the work of nearly 275 designers, were included.

Eberhard Faber Announces Pencil-Drawing Competition

Eberhard Faber Pencil Company, of Brooklyn, New York, has announced a competition, open to high-school students, for the best drawings made with Mongol colored indelible pencils. A number of prizes are offered in connection with the contest, which closes on January 31, 1931.

The first prize is an art scholarship of two years in the art schools of America and Europe. The second prize is $200 toward one year's tuition in an American art school. The third prize is $75 in cash, and the fourth prize is $25.

Complete information concerning the contest may be obtained by writing to the Faber Pencil Company at 37 Greenpoint Ave., Brooklyn, N. Y.

Itinerant Courses in Aviation

Evening classes in aviation are being taught at Appleton, Wausau, Milwaukee, and Manitowoc, Wis., under the auspices of the University of Wisconsin. Mr. Patrick Case, of San Diego, Calif., has been engaged as itinerant instructor for these classes. The courses are divided into four parts, covering aeronautics, airplane engines, navigation, and meteorology.